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SYMBOLS OF SIGNIFICANCE

MAPHARSEN



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Human Reactions to Experimentally Induced Impact Forces*

H. R. BIERMAN, *Commander, MC, USNR, Bethesda, Md.*

THIS paper applies to any field of medicine where the application of force causes injury. Current investigations in the Acceleration Unit at the Naval Medical Research Institute have implications which go beyond the bounds of aeronautics. Applications of these studies to many types of trauma are now evident. During the war, the problem of aircraft crashes was paramount, but because of circumstances it was a difficult problem to attack except from a preventive angle.

Within the past ten months studies of a fundamental nature have been undertaken on mechanical forces. These forces can be thought of as the etiologic agent of trauma. They have a definite structure just as bacteria or known viruses possess certain characteristics. A force can be described by its magnitude, duration, and pattern. A force even has an "incubation period" in that a certain time is required before its effects become clinically apparent. True, this incubation period is measured in milliseconds rather than days or weeks, but none-the-less it is a definite period. Forces, if large enough, may cause injury, or, if small, may be without physiological effect. They can be applied for long durations. Forces may be smoothly applied or may possess many irregularities or oscillations. The type of force greatly influences the sequence which follows, and a resistance to some types of forces can be developed. The treatment with which we are concerned is mainly that of prophylaxis, or alteration of the force so that the individual can tolerate a given amount of energy without injury. All these circumstances determine the effect of a given force upon the human.

It is known that some individuals have sur-

vived forces calculated to exceed 200 G.⁵ These are usually referred to as "lucky" or "miraculous" escapes. But if one dares the damnation of superstition, it is evident that in the scientific world, luck or a miracle do not exist, per se. We feel that in such cases a peculiar train of physical events occur, rare to be sure, but none-the-less effective in permitting survival of an otherwise fatal accident.

One of the approaches to this problem has been to study these so-called lucky sequences with an ultimate goal of devising an apparatus or garment which can channel the force of a given acceleration into a preferred path and prevent injuries and fatalities.

It is reasonable to assume that the accelerations involved in aircraft crashes are not uniform. Therefore, in considering any procedure for protecting individuals from injury during such crashes, one must of necessity interpret the simple physical formulae for acceleration with caution.

One fact which stands out in crashes of military aircraft is that up to reasonably high forces (about 60 G), despite destruction of the wings, tail, under-carriage, and engine, the cockpit usually remains intact. (Fig. 1.) The fear of telescoping of the aircraft to crush the occupants, so common in the early days of aircraft construction, no longer exists in most military and a fair number of civilian aircraft. The aircraft industries have altered the pathogenesis of injury by more modern methods of construction so that personnel are now injured or killed in crashes by being flung about within an intact cabin or cockpit area. This factor is most evident in crashes aboard aircraft carriers where the entire sequence from before, during, and after a crash is followed by observers aboard the ship and can be photographed in slow motion. A study of these sequences has shown

* The information contained herein is that of the author and not necessarily the policies of the United States Navy.

that it should be possible to protect individuals within the cockpits of aircraft which remain intact during crashes involving large forces. This, of course, is of great importance to personnel flying in aircraft and not actually in control, such as the passengers in a transport plane.



Figure 1.—Corsair which crashed during field carrier practice from 50 ft. at approximately 80 miles an hour. The wings, tail, engine and under carriage are demolished yet the cockpit is intact.

In the summer of 1945, the impact decelerator¹ was devised and with this instrument we have been able to study the reactions of humans under impact forces. All investigations were carried on, using ourselves and other volunteers as subjects.

In military aircraft, the pilot is secured in his seat by means of a restraining harness, i.e., shoulder straps and seat belt. If a plane is involved in a crash, sudden deceleration occurs, the plane stopping rapidly, usually within ten to forty feet. Provided the seat remains secured to its foundations, the individual is thrust against the shoulder straps and seat belt. Thus, the force of deceleration is applied largely to the individual's thorax and abdomen by means of this restraining device.

A similar effect may be obtained by suddenly jerking the restraining harness back against the individual. This enables the subject to receive an impact force with relatively little motion so that the investigator can closely observe him throughout the exposure. I can tell you that this was a most important factor during these initial studies for we were embarking on an entirely new field with little previous experience to afford any assurance as to the immediate outcome or as to injuries which might develop at some later date.

To do this, the impact decelerator was conceived in its rather simple form. To produce the necessary impact force, falling weights were used (Fig. 2). The weights are raised to a predetermined height and, upon a given signal, are released. They are arrested at the bottom of their fall by a plate fixed to a 65-inch steel rod, which then transmits the force back up the rod through the restraining device to the thorax and ab-

domen. Physiological measurements of respiration, electro-cardiographic tracings, ear pulse, ear opacity, peripheral pulse configurations, blood pressure and intra-abdominal pressures may be recorded simultaneously with the physical data of the force and time.

The respiratory pattern has been successfully recorded by inserting a thermo-couple, appropriately shielded, in each nasal air-way (Fig. 3). These elements are small, possess little inertia because of their small mass (they weigh less than 5 grams each) and they are extremely sensitive. During inspiration, the thermo-couples are exposed to the temperature of the environmental air. During expiration they record the temperature of the air coming from the lungs. Mouth breathing does not materially alter the pattern although nasal breathing is preferable.

The use of electrical wire strain gages has proven quite a boon in measurement of small displacements. A wire strain gage consists of fine wire placed against a metal surface so that small bending movements of the metal surface will change the resistance of this wire. With an appropriate electronic device these small movements of the metal surface can be recorded. Such a device can be placed over an artery and the pulse configuration can be easily detected. This same device can be used to measure impact pressures, cardiac impulse, blood pressures, and a large number of other physiological phenomena which are adaptable to its peculiarities.

The ear opacity and ear pulse are measured by detecting the amount of light transmitted through the ear to a photoelectric cell. The changes in the

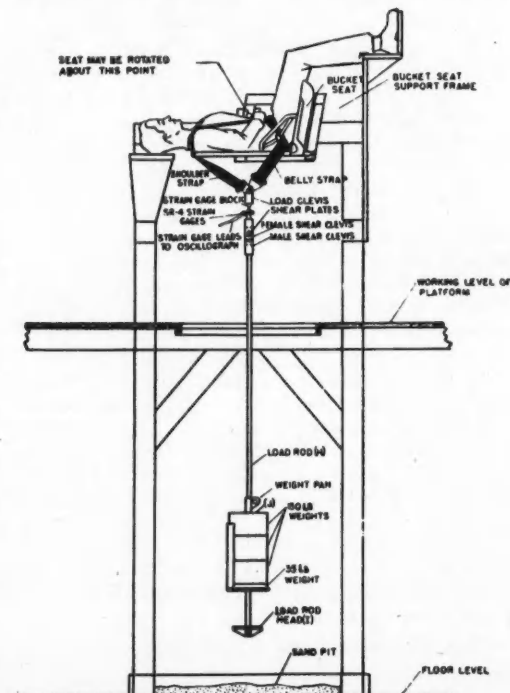


Figure 2.—The Impact Decelerator.

amount of light transmitted are a reflection of the volume of blood and pulse characteristics within the ear at the moment.

It should be emphasized that the stresses produced by airplane crashes and by the impact de-

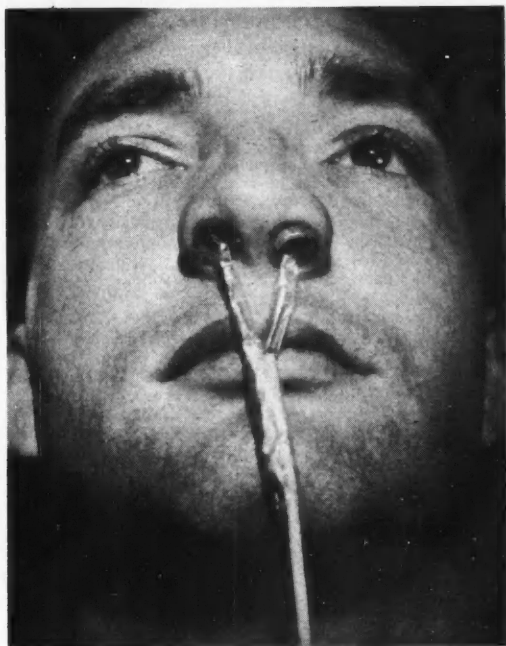


Figure 3.—Illustration showing plastic cylinders containing thermo-sensitive wire which are inserted into the external nares and are used to record the respiratory pattern.

celerator are comparable, but they are not necessarily identical. When more elaborate investigative methods (such as those involving human catapults, etc.) are available, it will be possible to duplicate more exactly the types of linear accelerative forces occurring in airplane crashes. Until that time the impact decelerator offers a highly useful and convenient technique for studying some effects of these forces.

The impact decelerator applies the forces directly to the subject. In an aircraft crash the forces are applied first to the aircraft structure and transmitted to the subject only through the seat and its attachments to the restraining devices. During such transmittal of force, there is undoubtedly an absorption of energy in the aircraft structure so that in all likelihood the force applied to the subject is less than the initial force at the point of the impact of the aircraft.

Studies at the Acceleration Unit have shown that it is possible to improve one's tolerance to impact forces. Using the decelerator it has been shown that with the current regulation harness the human subject can tolerate approximately 2,000 pounds peak impact force delivered within 0.15 second. The area of the current regulation harness is 76 square inches applied to the average thorax and abdomen. When this area of coverage

is increased to 156 square inches by the use of a vest-type restraining harness, the tolerance limit is then increased to 3,300 pounds. Beyond this point we have seen ligamentous detachments, muscular and costochondral separations, and hematomas into muscle groups. These findings together with untoward physiological changes are used as the criteria for the limit of tolerance to impact forces.

It then became evident that if any significant increase in protection against impact forces was to be attained, it would take more than just increase of area and distribution of force. It had been shown in previous studies that the distribution of the force in the current regulation harness was not uniform despite the fact that the straps themselves were of uniform width. (Fig. 4.) Thus the greatest force was concentrated at an area in the vicinity of the umbilicus near the coeliac plexus which as you know is quite sensitive to impact forces, and can easily produce temporary incapacitation. During water landings at sea, pilots have been observed in the cockpit to be dazed and, when the plane sinks, to make no apparent effort to escape. The same applies to the fire hazard following crashes ashore. When these individuals are recovered, often little if any positive findings other than simple drowning or burns can be made. We feel that it is possible that these individuals have been momentarily stunned by a concentration of the impact in the neighborhood of the coeliac plexus despite the fact that the

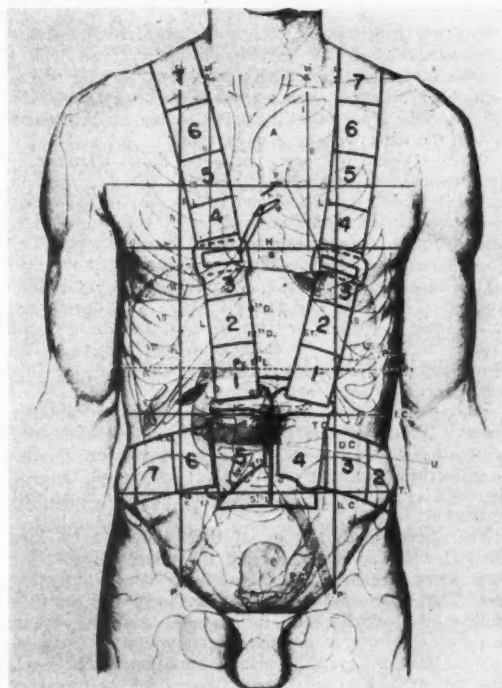


Figure 4.—Composite schematic drawing to illustrate the pressure distribution. The impacts produced maximal pressure forces at positions 6 and 7 on both shoulder straps. The maximal pressure areas on the seat belt were found at positions 4 and 5.

force of the crash is not excessive. Therefore, it is necessary to find some way to equalize the distribution of the force over this increased area to prevent concentration at certain vital points. This can be obtained by utilization of a material which will allow the body to form-fit into the harness during the impact.²

Further investigations on the impact decelerator, including high speed cinematography, afforded an opportunity to observe the effects of the early part of the impact. The rate of loading was found to bear a critical relationship to the subject's tolerance toward maximal loads.³ Rapid applications of the force, attaining a peak in less than 30 or 40 milliseconds, were uniformly disliked. In general, the slower rates of loading were preferred. An optimal rate of loading exists, however, since slowing the rate of loading too much may cause a reduction in tolerance.⁴

SUMMARY

1. The possibility exists of surviving high impact forces in crashes in military aircraft.
2. The magnitude and duration of a given force in part determines its effect upon the body. Increasing the area of distribution of a force reduces the untoward effects upon subjects.
3. Forces should be distributed to those areas

of the body more capable of withstanding these forces.

4. The rate of loading bears a critical relationship to the tolerance of the subject to impact forces.

5. Small oscillations and irregularities in a force are disagreeable to subjects.

6. Force is the etiological agent of trauma, and as such requires much further investigation of a fundamental nature.

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FIVE PHYSICIANS WARN AGAINST USE OF NEW DRUG FOR EPILEPSY

The new drug tridione, widely acclaimed for the treatment of epilepsy, has been found to carry an unpredictable toxic reaction and five physicians, writing in the September 7 issue of *The Journal of the American Medical Association*, warn that the public should not be allowed to buy the drug without a prescription.

While tridione has been tried and found effective in the treatment of hundreds of epileptic patients with no apparent ill effects, two women are known to have died as a direct result of administration of the drug. Their case histories are reported in two separate articles in *The Journal*.

One case is reported by Drs. Francis F. Harrison, Roswell D. Johnson and Darrell Ayer, of Cooperstown, N. Y., and the other by Drs. Roland P. Mackay and Werner K. Gottstein, who are from the Department of Neurology and Neurological Surgery, University of Illinois College of Medicine, Chicago.

Both patients died from a disease known as aplastic anemia. This condition often develops in persons who are poisoned with benzene or similar substances, or who have worked too long with radium or x-rays. One of the chief symptoms of the disease is deficient blood cell formation.

The Cooperstown doctors say their patient, a 16-year-old girl who had suffered from convulsive seizures for three years, died following the use of tridione and hydantoin. The treatment, they say, was successful in controlling the attacks, but the patient gradually began to notice difficulty in breathing, palpitation on exertion, unusual fatigue, and a throbbing sensation in her head. The patient later suffered hemorrhages. All the measures used to prevent and treat infection, stimulate blood cell production and arrest bleeding proved of no value.

The two Chicago doctors say their patient was a 23-year-old unmarried woman who had suffered convulsive

seizures since she was five years old. After repeated major convulsive seizures, tridione was administered. Later she suffered from severe headaches, with vomiting, generalized weakness and fatigue. Autopsy revealed extensive hemorrhages throughout the body.

In discussing the case, Drs. Mackay and Gottstein say: "There is little doubt that death was due to tridione. The only drugs used by the patient for ten months prior to her death were phenobarbital and tridione, and she had taken phenobarbital almost constantly for 19 years without ill effect.

"The destruction of the elements of her blood was delayed but abrupt. The acute onset of her illness came only after ten months, but it came suddenly. These facts strongly suggest a progressive accumulation of the drug, or of toxic fractions of it, in the body. As late as two days before her admission to the hospital she walked several blocks without distress. The process was therefore catastrophic and apparently uninfluenced by vigorous treatment."

After outlining several suggestions to other physicians on the use of tridione, the Chicago doctors say:

"Unprescribed sale of the drug to the public should not be allowed. The present enthusiasm for tridione, both among the profession and with the public, is very great, because of the glowing accounts which have appeared in the scientific and public press, and even on the radio. The public knows the drug by name and can buy it on the market. A doctor's prescription is recommended on the company's labels and should be required.

"Finally, further research with tridione and related substances must be carried out. Despite the unfortunate toxic effects of tridione revealed in this case, the drug offers great promise for effective control of the most stubborn of all convulsive disorders, if its dangers can be avoided. This promise should be fulfilled."

Dermatologic Aspects of Dermatitis Due to Atabrine*

RICHARD O. PFAFF, M.D., *San Jose*

MY part of this symposium on Untoward Effects of Atabrine will be limited to a brief discussion of the dermatologic aspects of this new clinical entity. It is not my purpose to discuss therapy, the etiology, histopathology or laboratory observations.

While serving at a large naval hospital in the New Hebrides, I observed in the late part of 1944 and the early part of 1945 a group of cases which later were attributed to the effects of atabrine. Here it might be mentioned that, contrary to the belief of some observers, typical lichen planus, histologically and clinically did occur from time to time in the Solomon and New Hebrides areas. This fact, in the beginning, was somewhat confusing when this group of cases was first brought to our attention. All the cases observed were from the New Guinea areas. They occurred in both ship and shore based personnel.

Three types of atabrine dermatitis were observed and for discussion they are divided into (1) Eczematoid type, (2) Lichenoid type, (3) Exfoliative type.

Eczematoid Type: At the onset of the disease, the presenting eruption was varied. In many instances the lesions were merely scaly patches resembling a tinea, or an erythematous papular vesicular eruption confined to the dorsal aspects of the arms and hands and about the neck. Frequently the lesions were edematous and weeping. Bullae were not observed in this particular group. Later, other sites became involved, such as the eyelids, ears, scalp, bearded region and pubes. These early eruptions closely resembled a dermatophytosis with an "id" eruption, a seborrheic dermatitis or eczema. The early eruptions were extremely resistant to therapy. Secondary infections were common. On involution the lesions became dry and scaly, or progressed to the development of the pigmented, flat, or hyperkeratotic lichenoid type. In some of the patients with the eczematoid manifestations, the eruption was confined to the cheeks and nose, closely resembling lupus erythematosus. These patients later developed other lesions on the extremities, which when healed left a thin, dry, slightly scaly atrophic scar.

Nisbet² mentions the involvement of the external ears which consisted of an erythematous vesicular eruption appearing first on the lobes and later involving the rim of the ear. This, he stated, may precede by weeks or months any other manifestations of the disease.

The involvement of the scalp and other hairy parts was rather unusual. There was a patchy alopecia accompanied with a severe inflammatory

dermatitis of the scalp with a resultant peculiar shiny wrinkled atrophy of the skin.

Lichenoid Type: If the lesions went on to the development of the lichenoid type or if this type developed independently there occurred dusky purplish-red papules covered with greyish scales and closely resembling the lesions of lichen planus. These usually were noted first on the dorsal aspects of the hands and the flexor surfaces of the arms and legs, and on the lateral sides of the neck and about the eyes. The papules might coalesce to form raised plaques, or, as the condition continued to spread, new patches appeared with a gradual fusion of involved areas and with a variable extension to the trunk and scalp. The papules tended to become verrucous and assume a pigmented appearance. In some cases, there was a generalized eruption consisting of small follicular papules which were acuminate and reddish brown, about pin-head in size and topped by a horny plug. This was accompanied with a mark scaling and erythema of the scalp and was associated with a hyperkeratosis of the palms and soles with a tendency to fissuring. The nails were dull, rough, striated and brittle. In other cases the lesions had a tendency to become verrucous or nodular and were usually located on the lower extremities. They were most frequently diagnosed as hypertrophic lichen planus. The classical lichen planus papule with Wickhams striae was rarely seen.

The lesions might extend rapidly or progress slowly with new lesions appearing on other parts of the body but the upper back was usually spared. The lesions of the eyelids at the time I observed them were slate colored infiltration of the lower or upper or both eyelids.

The buccal mucous membrane lesions were either leukoplakia-like or resembled the lacy configuration of lichen planus. An atrophic area in the mid dorsal area of the tongue has been observed by some. The lesions involving the vermillion border of the lips and the external genitalia are similar to those of lichen planus.

Captain Louis Goldberg¹ investigated the amount of gastric and rectal involvement. He stated that of twenty cases, three had involvement of the rectum. These occurred on the columns of Morgagni but never in the crypts. They were present 1 cm. or more above the anal cutaneous junction, but not in the sigmoid colon. No lesions were found in the stomach on gastroscopic examination. The rectal lesions disappeared after treatment.

One of the most striking characteristics of the disease was the pigmentation which accompanied it. Some of the plaques and pigmented area of the skin developed spotty hyper and depigmentations and a telangiectasias. In some, the pigmentation

* Read before the Section on Dermatology and Syphilology, at the Seventy-fifth Annual Session of the California Medical Association, Los Angeles, May 7-10, 1946.

tion was a peculiar slate color. This pigmentation, in addition to the atrophies of various areas, the mottled alopecia of the scalp and other hairy parts, gave the patient a most unusual appearance. It is said that the atrophy and scarring has produced considerable permanent facial disfigurement of some cases.

Generalized exfoliation might occur following either the eczematoid or the lichenoid type or it might come primarily as an erythoderma. Occasionally it resulted from injudicious treatment. When it did occur the skin from the top of the head to the soles of the feet was weeping. The odor was foul. All lymph glands were greatly enlarged.

When exfoliation occurred in the lichenoid type, the pigmentation of the skin lessened. I observed one patient who exfoliated several times, and whose pigmentation became less with each exfoliation.

At the time of my observations the constitutional symptoms were minimal. Easy fatigue and loss of weight were the most frequently observed.

SUMMARY

The clinical manifestations of dermatitis due to atabrine were varied, but for the most part can be classified as either eczematoid, lichenoid or exfoliative. One can merge into the others, or the manifestations of both can be present in the same individual. Healing is accompanied with spotty hyper or depigmentations, atrophies, slate colored infiltration, and a variable alopecia.

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Atabrine Dermatitis and Associated Aplastic Anemia*

JAMES R. DRAKE, M.D., *San Francisco, AND*

HENRY D. MOON, *Captain, Medical Corps, A.U.S.*

PART I—ATABRINE DERMATITIS

AS early as 1943, a large number of patients with skin eruptions resembling and at first diagnosed as lichen planus, began to appear among the service men and others connected more or less directly with the war effort. The disabling nature of this disease with its unusual manifestations attracted the attention of many dermatologists.

In this paper, not all phases of this disease will be covered, but a brief description of the cutaneous lesions which were observed for the most part at Letterman General Hospital in San Francisco will be presented. This hospital received the majority of the dermatological cases being evacuated to the United States from the Southwest Pacific area. Therefore, hundreds of cases were seen. Most of these patients were observed for short periods because they were soon distributed to inland hospitals nearer their homes. For this reason most of the cases were observed during the early and active phases of the disease. There have been comprehensive studies by other workers regarding the etiology of these cutaneous lesions; reports of some of these studies are not yet published. At present it is generally accepted that atabrine is the chief etiologic factor. The cutaneous reactions to atabrine may be divided into three groups: (1) the lichenoid, which is the type primarily to be considered in this report. (2) the eczematoid, and (3) the generalized exudative and exfoliative type.

Lichenoid: This reaction was manifested chiefly by the appearance of pigmented, round or oval, elevated hyperkeratotic and verrucous lesions 0.5-1.5 cm. in diameter, and often by violaceous plaques attaining several centimeters in size. These occurred predominantly on the extremities, usually with the heaviest involvement on the legs, giving the appearance of hypertrophic lichen planus. Often they were concentrated on the buttocks and pubic areas. Although the sides of the neck and thorax were commonly involved, lesions on the upper portions of the body were generally less hypertrophic than those on the lower extremities. The face was commonly affected with pigmentation and thin scaling of the eyelids, especially the upper lids. On the scalp, a follicular hyperkeratotic process resulting in alopecia often occurred. Total alopecia of the scalp has been followed by a patchy regrowth in many cases. The eyebrows, especially the lateral halves, may likewise be affected. About 30 per cent of the cases have mucous membrane lesions of the lips, tongue, buccal mucosa, or palate. The onset of the mucosal disease was usually marked by discomfort and finally resulted in white, silvery or gray areas simulating lichen planus. Certain light complexioned individuals had erythematous lesions with extensive follicular spine formation. These were found about the shoulders, thorax, and outer surfaces of the thighs, and have been noted to coexist with the verrucous type already described. This form healed with atrophy, and not uncommonly with areas of anhidrosis. Subsiding lupus erythematosus may enter into the differential diagnosis of this form.

Eczematoid: The eczematoid type may simu-

* Read before the Section on Dermatology and Syphilology, at the Seventy-fifth Annual Session of the California Medical Association, Los Angeles, May 7-10, 1946.

late an extensive eczematoid dermatitis, nummular eczema, or fungus infection. Indeed, differential from generalized contact dermatitis resulting from jungle vegetation has at times been difficult. Distribution of lesions on the feet, ankles, legs, wrists, forearms, sides of the neck, pinnae, and scalp was fairly constant. The trunk likewise often presented well-margined patches which were strongly suggestive of a fungus infection. A weeping dermatitis was commonly found in the groins and the bearded area. The entire eczematoid process may vary from the acute exudative to the chronic erythemasquamous stage.

The history of many of the lichenoid cases revealed that the lichenoid phase was preceded by this patchy eczematoid type. I have seen the transition occur, and have personal reports from other observers confirming it. The existence of both types concurrently was frequently seen.

Generalized Exudative and Exfoliative Type:

This reaction was seen less frequently than the two preceding types. Cases in which the exudative phase predominated were often difficult to separate from those with a severe and extensive eczematoid type. Some patients with the exudative and exfoliative type were moderately to seriously ill, with a reduction of total serum proteins, a bacteremia, and a septic course.

All three types of cases showed weight loss from 10 to 40 pounds, being most pronounced in the extensive eczematoid and exfoliative groups. A number of deaths have occurred in patients with these cutaneous reactions, and a discussion of some of these will form the second part of this paper.

Most individuals with these reactions showed some evidence of photosensitivity, particularly those with the lichenoid type. There was frequently a diffuse slate-like pigmentation of the face and dorsa of the hands as well as of the lips.

Etiology: The etiology of these peculiar cutaneous reactions has been the subject of considerable speculation and discussion, particularly among military dermatologists, for the past three years. Obviously the incidence of these reactions has been higher in men, but a number of cases have been seen among members of the Army Nurse Corps and in female Red Cross personnel.

Careful histories revealed that most of the patients first sustained some type of injury to the skin, such as abrasions with secondary infection, insect bites or contact dermatitis. As these conditions healed, the so-called lichenoid or eczematoid reaction became superimposed upon them.

Geographically, New Guinea was the most important island from the standpoint of incidence of these reactions, although many occurred in other islands of the Southwest Pacific Area. The condition was not limited, as was first thought by some observers, to the Southwest Pacific area. We saw six cases of the mild lichenoid type in patients from North Africa and Sicily. In noting the ages of 65 consecutive patients admitted with the lichenoid type, it is interesting that 45 were in

the early fourth decade of life. This is notable in that this age is definitely above the average for the men who were in the Southwest Pacific Area at large.

In the group of patients with the lichenoid type which were studied, the average period of service in the Southwest Pacific area at the time of onset was 5.9 months, exclusive of service in Australia.

Probably the most important single etiological factor to be considered is atabrine. To the best of my knowledge, Nisbet first suspected and reported atabrine as the prime etiological factor. It can be stated conservatively at this time that there is much circumstantial evidence pointing to the prolonged prophylactic use of atabrine as the cause of the cutaneous reactions described above. Several workers are reporting original work which will quite conclusively demonstrate the role of atabrine in this clinical entity.

The incidence of these reactions in the Army and Navy was low. Without atabrine, the war effort in the Southwest Pacific area would have been very seriously handicapped.

Pathology: In the lichenoid lesions in the hypertrophic stage, the surface is moderately to extremely verrucous. There appears marked thickening of the epiderm with elongation of the interpapillary processes, varying degrees of hyperkeratosis, and a prominent granular layer. Zones of parakeratosis are seen in some sections with corresponding loss of the granular layer. The rete pegs are often of an acuminate shape, resembling those found in lichen planus. Perinuclear vacuolization and a disturbed basement membrane are usually seen, together with intercellular edema. In the dermis there appear varying degrees of collagenous degeneration and destruction resulting in a loose arrangement of connective tissue fibers. Within the meshes of these fibers are infiltrating cells, mostly lymphocytes, together with varying numbers of endothelial cells. These changes are found chiefly in the papillary and subpapillary levels, where considerable vascular dilatation is also seen. In most cases pigment is found both intra and extracellularly throughout the upper dermis. As healing progresses, there is a marked reduction in hyperkeratosis, a thinning of the epiderm with shortening of the interpapillary processes, reduction of the inflammatory reaction, and, frequently, varying degrees of atrophy. Atrophic changes occur also in the arrectores pilorum muscles and in the sudoriparous glands. A perivascular infiltrate is seen forming strands, some of which extend into the deeper levels of the dermis.

An insufficient number of sections from late healed cases have been studied to describe the ultimate picture. Some sections are apparently indistinguishable from those of lichen planus. Sections from the eczematoid group are very similar to eczema with the usual findings indicative of inflammation and weeping. It is noticeable, however, that many sections reveal club-shaped rete pegs, suggestive in this respect of psoriasis.

Treatment: General supportive treatment including good diet and often supplementary vitamin intake, together with cessation of atabrine administration, is indicated. The eczematoid and exfoliative types are treated along generally accepted lines. It should be emphasized, however, that all local therapy must be very bland, as these cases do not well tolerate stimulation. In the exudative cases, Burow's (1-16) or boric acid solution compresses or starch baths are very helpful. During the interval between compresses or baths, dressings of bland creams or ointments are often necessary, although these may occasionally aggravate some cases. Lubrication with cocoa butter is usually indicated for the subsiding dry erythematous-squamous stage.

Attempts to use heavy metal therapy in the lichenoid type have proven unsatisfactory. The results of arsenical preparations such as Fowler's solution were likewise disappointing. X-ray therapy, except in a few localized, very hypertrophic lesions, was unsatisfactory and is not recommended.

Although the average case subsided within two to three months after returning to the United States and discontinuing the use of atabrine, many are subject to relapse, particularly those of the eczematoid type.

PART II—APLASTIC ANEMIA

Aplastic anemia was the most common cause of death in patients with skin lesions due to atabrine. Of nine cases with atabrine dermatitis coming to autopsy over a period of a year and a half, seven had aplastic anemia. In the other two cases, pyoderma with sepsis and acute yellow atrophy of the liver were the causes of death.

TABLE 1.

Case	Skin Lesions	Aplastic Anemia	Acute Yellow Atrophy of Liver
A-2367	O	X	O
A-2374	O	X	O
A-2413	X	X	O
A-2415	X	X	O
A-2463	X	X	O
A-2482	X	X	O
A-2484	X	X	O*
A-2513	X	X	O
S-20892-A	X	X	X
C-21063-A	X	O	X
A-2408**	X	O	O
A-2468	O	O	X
A-2470	O	O	X
A-2490	O	O	X
A-2508	O	O	X
A-2515	O	O	X

* Small infarcts of liver.

** Developed pyoderma and died from sepsis.

During the same period there were nine cases of aplastic anemia, and of these only two did not have atabrine dermatitis. In contrast to the close association between atabrine dermatitis and aplastic anemia, acute yellow atrophy of the liver did not occur with any great frequency in patients with atabrine dermatitis or aplastic anemia. Of eight cases with acute yellow atrophy, two occurred in patients with atabrine dermatitis; one of these two also had aplastic anemia.

The presenting complaints in five of seven patients with both skin lesions and aplastic anemia were those due to dermatitis. The anemia in these cases was discovered on routine blood counts. However, the histories in these cases revealed that the patients had noticed weakness, fatigue, dyspnea on exertion, and bruising or hemorrhages for some time prior to entry into the hospital. Several of the patients had had dermatitis for as long as six months before entering the hospital. The hematologic findings in this group of cases were characteristic of aplastic anemia.

The anemia was marked in nearly all of these cases and was usually of the normocytic normochromic type; there was slight macrocytosis in some cases. Reticulocytes were decreased. The total leukocyte count averaged less than five thousand per cubic millimeter. In one case the white blood cell count dropped to less than a thousand per cubic millimeter. The leukopenia was characterized by a decrease in the number of granulocytes with a shift of the Arneith index to the right. Blood platelets also showed diminution in number in most of the cases in which this determination was made.

All of these patients rapidly pursued a downhill course. Terminally most of them developed extensive hemorrhages and sepsis. Autopsy findings confirmed the clinical diagnosis of aplastic anemia.

Bone marrow in these cases showed some variation. In most cases there was more or less complete aplasia with loss of almost all myeloid and erythroid cells and megalokaryocytes. Small groups of lymphocytes and plasma cells were present. There were occasional macrophages containing phagocytized blood pigment. In some cases the bone marrow showed areas of hyperplasia with extensive areas of necrosis containing degenerated myeloid elements, fibrin, macrophages, plasma cells and lymphocytes.

SUMMARY AND CONCLUSIONS

1. Three types of cutaneous reactions to atabrine have been described clinically and histologically; namely, the lichenoid, eczematoid, and generalized exudative and exfoliative types.

2. Treatment was briefly discussed. Cessation of administration of atabrine, general supportive care and dermatologic care along accepted lines were recommended. X-ray therapy was of no benefit except in a few cases of the hypertrophic type. The use of heavy metals and arsenic was not recommended.

3. Aplastic anemia was found to be the most common cause of death in patients with atabrine dermatitis.

4. In our cases there was no definite relationship of acute yellow atrophy of the liver either to atabrine dermatitis or aplastic anemia.

5. The frequent occurrence of aplastic anemia as the cause of death in patients with atabrine dermatitis suggests that there may be a common etiologic background.

Untoward Effects of Atabrine*

ALBERT G. BOWER, M.D., Pasadena

DURING the late war it was my privilege to see many patients who were receiving or had received atabrine therapy. By most, it was well tolerated, the only untoward sign being the yellow color imparted by the dye to the skin. By a few it was not tolerated, and it is of the various manifestations produced by the drug in this latter group that we wish to speak.

Atabrine has been said to produce fewer toxic symptoms than quinine. With this we disagree. Vomiting occurred as frequently as it does in quinine therapy but was usually of shorter duration. Nausea lasted longer. Some patients complained bitterly of "nervousness," a symptom not common with quinine.

About five patients per thousand became psychotic, but all we saw recovered. There were two types seen: one, insidious in onset, usually occurred about a week after the cessation of the therapy, and was accompanied by disorientation, gradual clouding of the sensorium, sluggishness

and inactivity, and the loss of memory for recent events; the other type showed markedly increased motor and psychomotor activity, frequently requiring sedation, and occasionally physical restraint. Visual and auditory delusions and hallucinations were common.

The skin manifestations were interesting and variable. Urticaria and exfoliative dermatitis occurred, the former usually transitory.

More spectacular were those cases which resembled lichen planus and were so labeled by many dermatologists, though the atabrine source of these cases was early recognized.

From the Caribbean and South Atlantic theater, cases were admitted to the hospital that greatly resembled lupus erythematosus disseminatus. These cases were proven by therapeutic tests in some instances, but not in all, to be due to atabrine. An interesting observation about these cases was their photosensitivity. After cases had cleared up during hospitalization, exposure to sunlight to a degree not previously harmful would again produce the lesions though no atabrine had again been used.

60 S. Grand Avenue.

* Read before the Section on Dermatology and Syphilology, at the Seventy-fifth Annual Session of the California Medical Association, Los Angeles, May 7-10, 1946.

ALLERGY DRUG PRESENTS SERIOUS INDUSTRIAL HAZARD—DROWSINESS

Two Rochester, N. Y., doctors warn that benadryl, a very effective drug for allergic skin diseases, is dangerous to persons operating any kind of machine, especially an automobile, because it may produce drowsiness, according to an article in the September 28 issue of *The Journal of the American Medical Association*.

Benjamin J. Slater, Associate Medical Director, Eastman Kodak Co., and Nathan Francis, of the Medical Department of the Eastman Kodak Co., in Rochester, state that "because of this narcotic side reaction incident to the taking of benadryl, the drug may be a serious hazard when used by persons operating automobiles or in industry operating moving equipment or machinery."

In their series of 65 cases, the authors point out that drowsiness was a common symptom in 25. "This figure

should be increased somewhat," they say, "as many of our patients were instructed to take the drug only at bedtime. Invariably they reported that they slept better than usual. Drowsiness may occur from one to three hours after taking benadryl, and this drowsiness may be cumulative if the drug is continued."

A case report of one of their patients serves to illustrate how dangerous the effect of the drug may prove. A 20-year-old man was given a 50 milligram capsule of this drug to relieve severe symptoms of hay fever. The second day of treatment he took the capsule just before going to work. He complained of feeling drowsy. An hour later, while driving an electric platform cargo truck, he lost control of the truck and it fell off the platform. Fortunately, he jumped in time to avoid injury.



Observations on the Function of the Clavicle*†

VERNE T. INMAN, M.D., PH.D., AND J. B. DEC. M. SAUNDERS, F.R.C.S. (Ed.), *San Francisco*

THE function of the clavicle is usually dismissed with the observation that it acts as a sort of flexible outrigger which serves as a prop for the shoulder, thus establishing the conditions necessary for free action of the arm. But such a statement is far too general and provides little understanding of the essential mechanism to enable us to interpret certain clinical derangements or to develop rational methods of surgical correction.

The shoulder itself constitutes a complex mechanism in which no less than three joints participate, the sternoclavicular, the acromioclavicular, and glenohumeral, as well as the accessory motion of the scapula on the thoracic cage. So intimately related and yet so diverse are these individual functions that it is impossible to treat one of the constituents of the shoulder without at least touching upon the mechanism of the others. Therefore, in considering the function of

the clavicle and in discussing such clinical problems as arise in association with dysfunction of this single member, it becomes necessary to touch, however briefly, on the range of movement occurring at the shoulder joint proper, so that we may follow some aspects of its sequence of motion in relationship to the other constituent bony levers.

The several joints which make up the shoulder complex, although capable of independent motion, all contribute their share to the total movement in a simultaneous but not successive manner. It is this simultaneity which results in that harmony of movement which Codman has so aptly called scapulo-humeral rhythm. It is of great clinical importance to recognize that any break in this harmony of rhythm is positive evidence of derangement in one or the other of the several components of the shoulder mechanism.

The most important movement for analysis is elevation of the arm, whether it be attained either through abduction or forward flexion. In these pathways there is little essential difference in mechanism except for minor details.

Elevation of the extremity, both in flexion and in abduction, at the glenohumeral articulation is simultaneously accompanied by scapulothoracic movement, an arrangement which critically en-

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† Read before the Section on Industrial Medicine and Surgery, at the Seventy-fifth Annual Session of the California Medical Association, Los Angeles, May 7-10, 1946.

From the Division of Orthopedic Surgery and Anatomy, University of California Medical School, San Francisco.

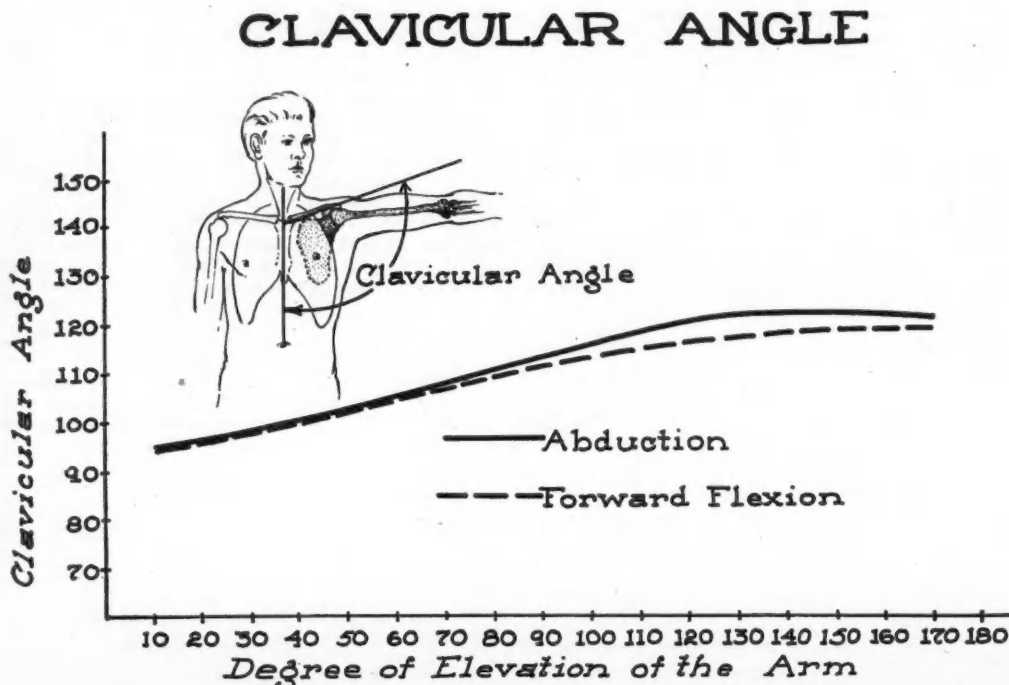


Figure 1.

SPINO-CLAVICULAR ANGLE IN THE CORONAL PLANE

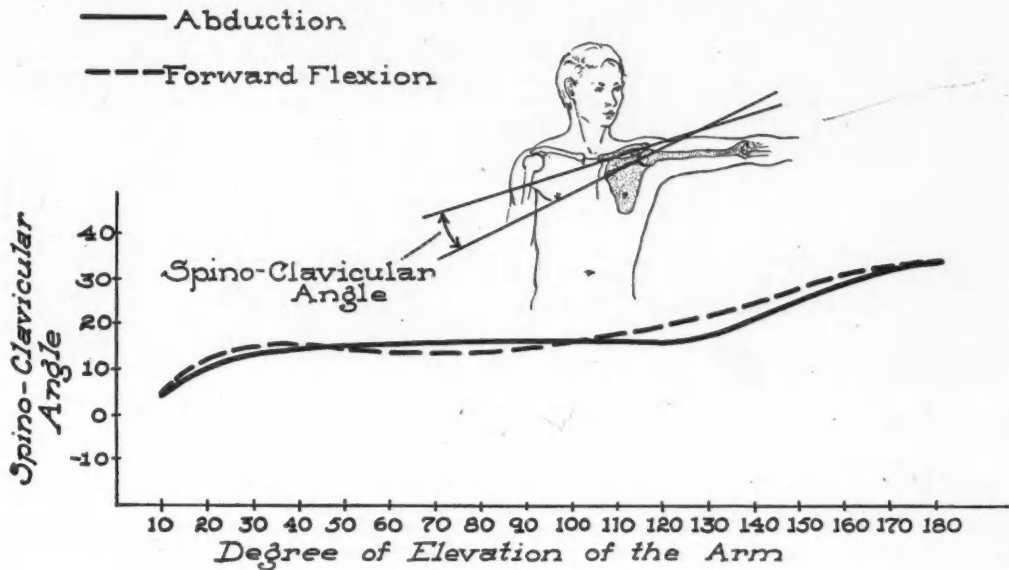


Figure 2.

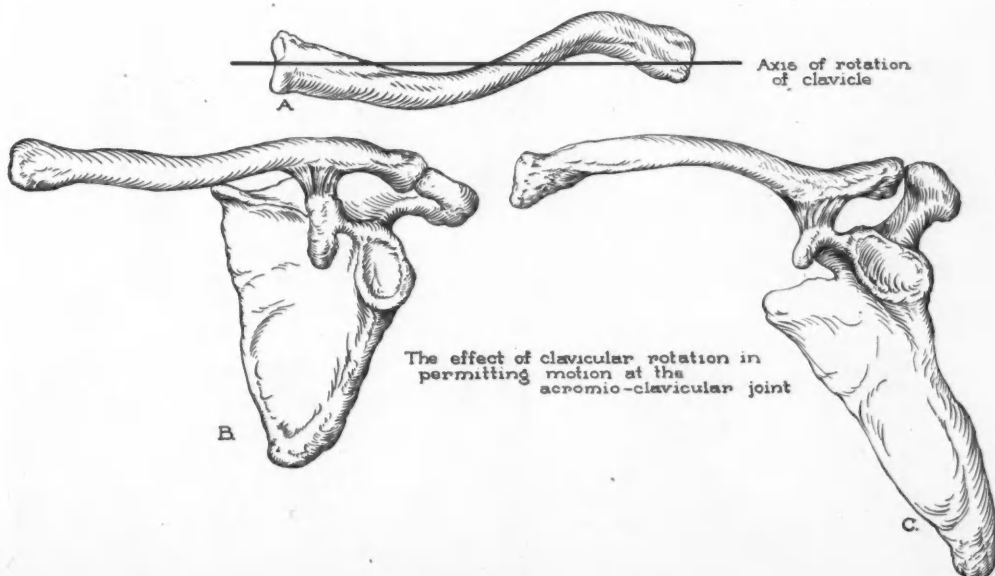


Figure 3.

hances the power of the attendant muscles. In the first 30 to 60 degrees of elevation, the scapula seeks, in relationship to the humerus, a precise position of stability, which it may obtain in one of several ways. Either the scapula remains fixed, motion occurring at the glenohumeral joint until the stable position is reached, or the scapula moves laterally or medially on the chest wall, or in rare instances oscillates until stabilization is attained. Hence the early phase of motion is highly irregular, and is characteristic for each individual. It would seem to depend upon the habitual position which the scapula occupies in the subject when at rest. This phase of motion is related to the

setting action of the muscles, and we have, therefore, termed it "the setting phase."

Once 30 degrees of abduction, or 60 degrees of forward flexion has been reached, the relationship of scapular to humeral motion remains remarkably constant. Thereafter a ratio of two of humeral to one of scapular motion obtains; and thus, between 30 and 170 degrees of elevation, for every 15 degrees of motion, 10 degrees occurs at the glenohumeral joint, and 5 degrees by rotation of the scapula on the thorax.

Roentgenograph and examination of the living prove beyond a doubt that scapular and humeral motion are simultaneously continuous. As this

ROTATION OF THE CLAVICLE AROUND ITS LONG AXIS

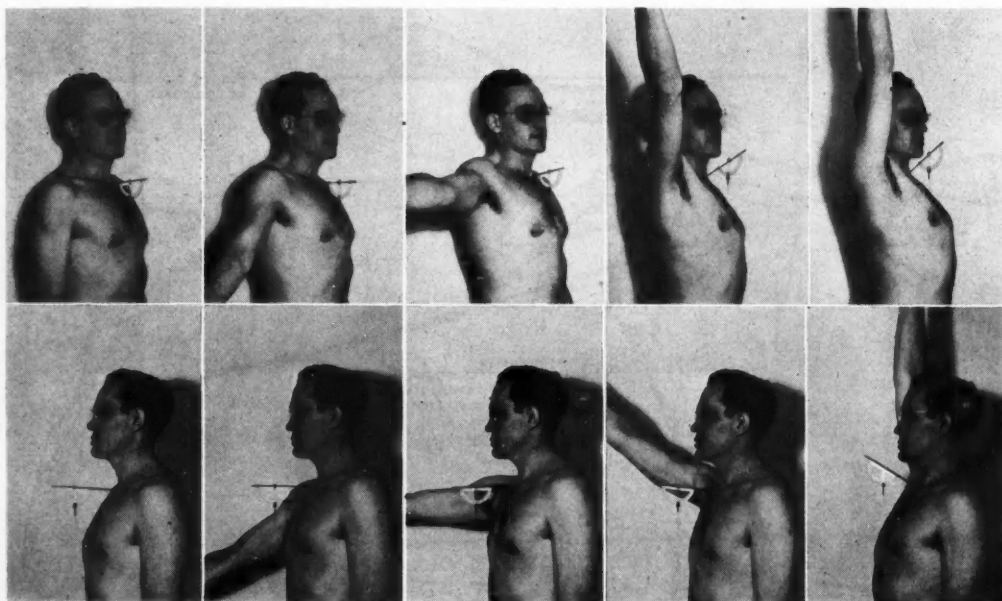
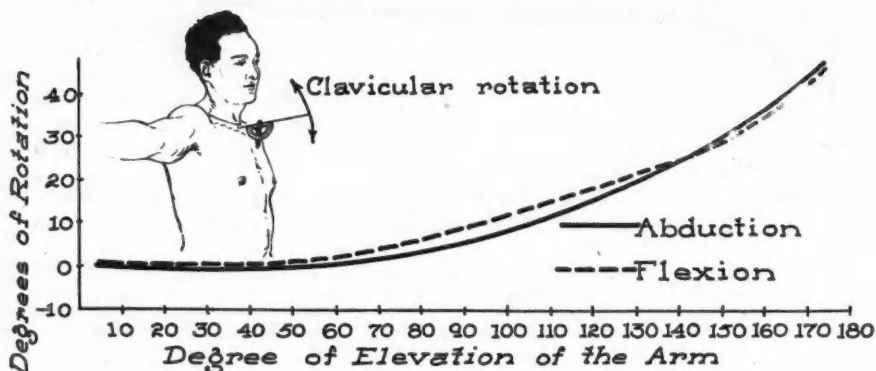


Figure 4.

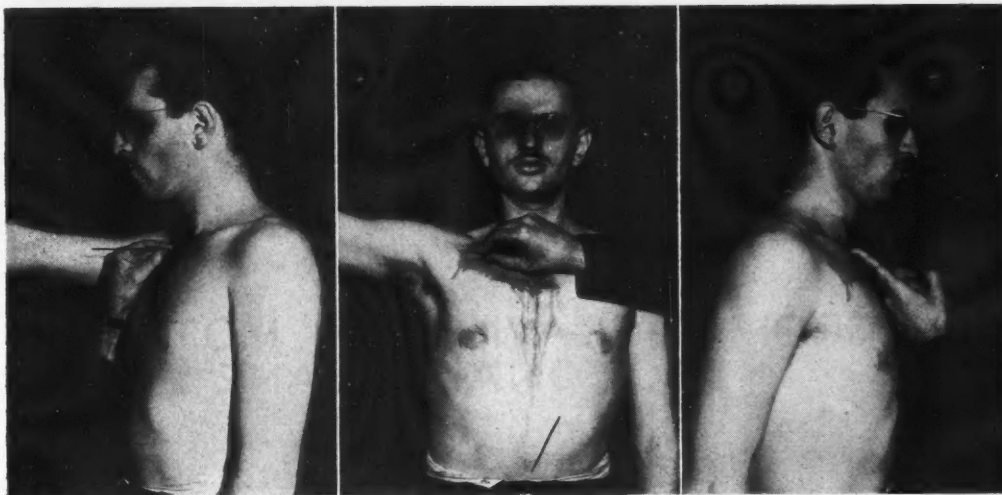


Figure 5.

ratio pertains, it is evident that the total range of scapular motion is not more than 60 degrees, nor that of the glenohumeral joint greater than 120 degrees. Under special and abnormal conditions, the motions of either one of these two joints can occur independently. For example, when the scapula is fixed, it is possible to raise the arm actively to the right angle and passively to 120 degrees.

Clavicular motion is more complicated than has been hitherto suspected. The continuous rotation of the scapula on the thoracic wall during elevation of the extremity is only possible because of the motion permitted at the two clavicular joints, and the phase and amount of movement is unequally distributed between them.

Elevation of the arm is accompanied by elevation of the clavicle at the sternoclavicular joint (Fig. 1). This movement begins early and is almost complete during the first 90 degrees, when for every 10 degrees of elevation of the arm, there are four degrees of elevation of the clavicle. Above 90 degrees, clavicular motion at this joint is almost negligible.

Motion at the acromioclavicular joint contrasts markedly with that found at the sternoclavicular joint (Fig. 2). The total range is approximately 30 degrees and occurs both early, in the first 30 degrees of abduction, and late, after 135 degrees of elevation of the arm. Between these two points there is almost no motion of this joint.

The sum of the movements at the sternoclavicular and acromioclavicular joints is naturally equal to the range of movement permitted the scapula. Anatomically it is possible to envisage an adequate range of movement occurring at the sternoclavicular joint but it is difficult to understand how motion of such extent could occur at the acromioclavicular joint, in view of the fact that the clavicle is rigidly attached at its lateral extremity to the

scapula through the medium of the coracoclavicular ligaments. For motion to occur at the acromioclavicular joint in the plane of elevation of the arm, elongation of this ligament would appear to be necessary, and on first sight this would seem to be impossible. Because of the marked curvature of the outer third of the clavicle, we could envisage a relative elongation of the coracoclavicular ligament, only by the clavicle rotating on its long axis, so as to allow this curvature to act as a crankshaft (Fig. 3).

The existence of such clavicular rotation about its long axis was demonstrated experimentally in the living subject by the insertion of a steel pin into the bone and the measurement of its range of motion with elevation of the extremity. The degree of rotation proved to be very appreciable and amounted on the average to a movement of 50 degrees. (Fig. 4.) How necessary this rotation is for the free elevation of the extremity was shown experimentally by manual interference of the movement through the medium of the pin inserted into the clavicle. Under these conditions elevation is promptly limited to about 120 degrees (Fig. 5). The clinical significance of these findings will be discussed later.

The effect of clavicular rotation on the coracoclavicular ligaments is established by anatomical dissections. A direct relationship is found to exist between the line of attachment (trapezoid line and conoid tubercle) of these ligaments, the amount of clavicular rotation, the extent of relative lengthening of the ligaments and furtherance of scapular rotation. (Fig. 6.) Thus, of the total 60 degrees of scapular rotation, the first 30 are due to the elevation of the clavicle as a whole by movement at the sternoclavicular joint and the second 30 degrees permitted at the acromioclavicular joint by clavicular rotation and relative elongation of the coracoclavicular ligaments. Therefore, the lateral curvature of the clavicle is of the greatest

significance. It permits the clavicle to act as a crankshaft and thus mechanically allows of no less than half of the scapular movement.

In protrusion and retraction of the shoulders, no appreciable motion occurs at the acromioclavicular joint (Fig. 7), nor is there any great rotation of the clavicle (Fig. 8), the movement occurring predominantly at the sternoclavicular joint.

These observations mutually clarify clinical

findings, and in turn are supported by them. The conception that the clavicle serves as a prop to the shoulder is not supported in those cases in which the bone is lacking or in which it has been excised. As is well known, the clavicle is absent or partially suppressed in that rare familial disorder, craniocleido-dysostosis. In these cases the disposition of the shoulders in the resting position is not markedly disturbed, but their range of motion is greatly enhanced, protrusion and retraction

ACROMIO-CLAVICULAR MOTION IN CORONAL PLANE

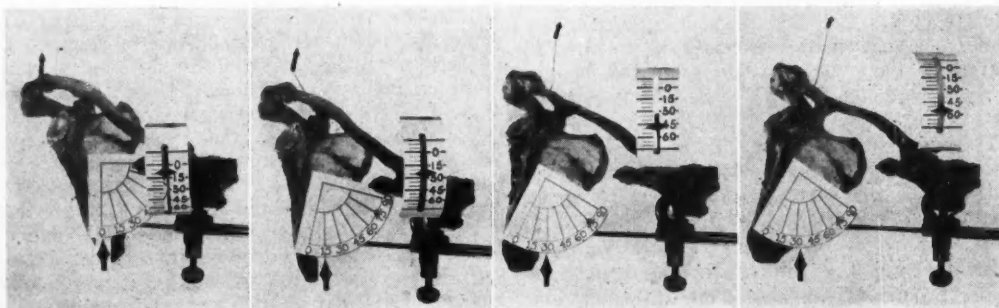
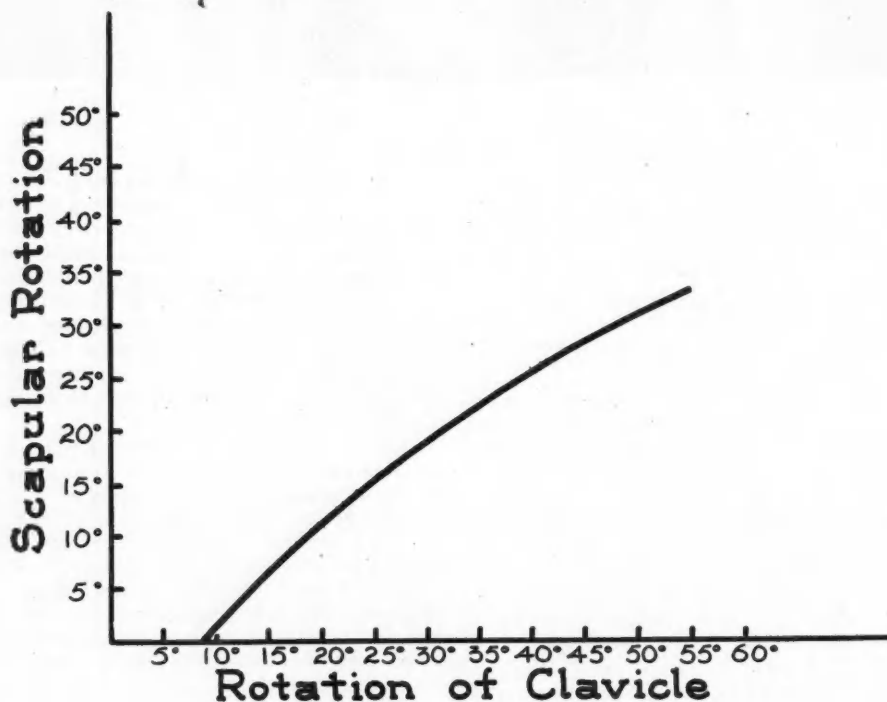


Figure 6.—Dissection of pectoral girdle mounted to demonstrate motion at the acromioclavicular joint. Gonio-

meters are attached to scapula and clavicle to indicate simultaneous angular changes for construction of graph.

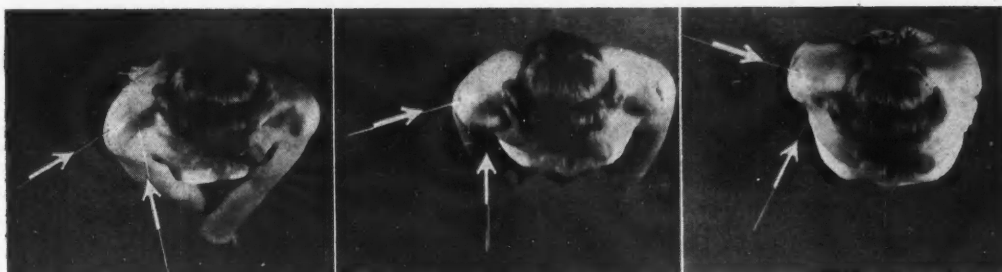


Figure 7.—Subject viewed from above. Pins inserted into acromion and lateral extremity of the clavicle. Note that there is little change in the angle between the pins during protrusion and retraction of the shoulders.

of the shoulder becoming very extensive and elevation being increased to beyond 180 degrees. (Figs. 9 and 10.) The lack of disability at the shoulder observed in this disorder has given us confidence in recommending excision of the clavicle in the presence of tumors and osteomyelitis of this bone. We have excised the entire clavicle in four patients. Diagnosis was a large expanding giant cell tumor, metastatic carcinoma of thyroid, Ewing's sarcoma and chronic osteomyelitis. The functional disturbance was negligible. The shoulder did not drop inwards and forwards as might be anticipated. The range of motion was increased and minor instability only occurred when a weight was supported over the head. On measurements there was no loss of muscle power and no complaint of dragging sensations in the arm. (Fig. 11 and Fig. 12.) These cases effectively dispose of the conception that the clavicle acts as a prop, but suggest that it contributes somewhat to stability in supreme elevation. Furthermore, our experience would lead us to recommend excision of the clavicle as an effective method of gaining an increase in the range of motion in arthrodesis of the glenohumeral joint.

As pointed out, clavicular rotation permits the final half of scapular rotation. With loss of this motion, abduction is limited to approximately 120 degrees. We have been able to demonstrate on several occasions the effects of this loss in the recently advocated method of treatment of acromioclavicular dislocation in which the clavicle is fixed to the coracoid by means of a metal screw, or in which the acromioclavicular joint is stabilized by the insertion of a metal pin. A single example will suffice to illustrate the unsatisfactory features of these methods of treatment.

CASE HISTORY

A 20-year-old student suffered an acute acromioclavicular dislocation of the right shoulder while playing football in September, 1943. Five days later the dislocation was reduced surgically and fixation achieved by the insertion of a metal screw through a drill hole in the clavicle into the base of the coracoid. (Fig. 13.) Following recovery from surgery the patient discovered that he was unable to elevate that arm above 110 degrees although no discomfort was felt. (Fig. 14.)



Figure 8.

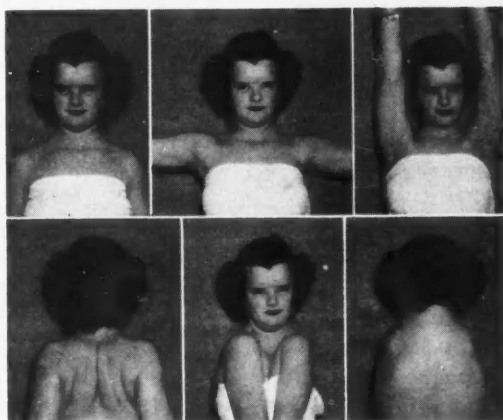


Figure 9.

In January, 1944, while running, he slipped and fell, forcibly abducting the arm above his head. Over the tip of the shoulder he suffered immediate pain which subsided rapidly. Following this he found that he had regained a complete range of motion. X-rays revealed that the screw had been bent and avulsed from the coracoid, permitting the clavicle again to rotate freely. (Fig. 15.)

In the surgical treatment of acromioclavicular dislocation where, apart from conservative methods, it is desirable to maintain the full range of active motion, one has a choice of restoring the torn acromioclavicular ligaments or excising the lateral half of the clavicle. If the procedure of resection is adopted the clavicle should be removed to a point medial to the attachment of the liga-

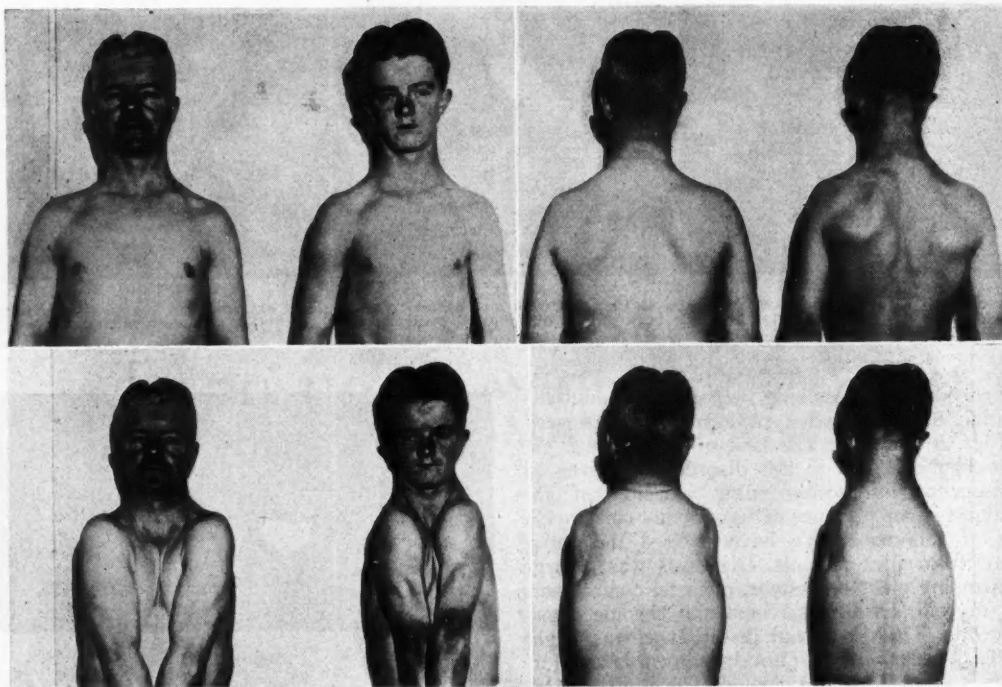


Figure 10.

ments. Otherwise, tension is still transmitted by these injured structures and pain will persist. If ligamentous restoration by fascia is chosen, it is important to insure that the clavicular attachment be placed as near as possible to the apex of the lateral curve of the clavicle. The unsatisfactory results from fascial reconstruction are often due to neglect of this point. Because of the cranklike action of the bone, it is necessary that the fascial suture follow, as closely as possible, the course of the normal ligaments. Otherwise there will be some limitation of movement and excessive stress thrown upon the repair.

Dysfunction at the shoulder sometimes occurs in association with fractures of the clavicle. Fortunately these complications are not common. An excessive exaggeration of the outer curve may interfere with the axis of clavicular rotation, resulting in displacement of its sternal extremity and pain at the related joint. We have recently seen examples of this type.

CASE HISTORY: CASE II

At the age of nine years the patient fell and fractured the right clavicle at the junction of the middle and inner thirds. The fracture was immobilized in a figure "8" of plaster. Healing occurred rapidly but with an increase in the medial curve and suppression of the lateral curve. No disability was experienced until several years later when increasing discomfort was noted at the sternoclavicular joint. When examined nine years after the original injury there was swelling over the right sternoclavicular

joint. The right clavicle was more prominent than the left with a definite increase in its medial curve. There was marked instability of the right sternoclavicular joint as compared with the left. On elevation of the right arm the sternal end of the clavicle described an arc instead of rotating through an axis passing through the center of the articular surface of the joint.

Loss of the lateral curvature of the clavicle on the other hand immediately prohibits the full range of scapular rotation and interferes with complete elevation. The decrease in elevation is directly proportional to the degree of obliteration of this curve and is only noticeable above 120 degrees.

From these observations it is clear that apart from serving as a link in the pectoral girdle, the fundamental and most important function of the clavicle is related to the existence of its curvatures. It is these curves, especially the lateral, which bring this bone into relationship with the scapula and indeed are responsible for the necessary freedom which the scapula must possess to provide the niceties of rhythm which are so characteristic of shoulder movement. All other aspects of clavicular function are subsidiary to its rotation. Consequently, any condition which results in interference with this motion, or changes its relationship to other components of the complex, will result in limitation of movement. It can be said that the presence of the clavicle is not entirely necessary in man, and its absence in no way restricts, but in fact increases, the range of shoulder

movement with but slight loss in stability. Nature in her endless experiments has in many forms entirely suppressed this structure.



Figure 10.

SUMMARY

1. The function of the clavicle is closely integrated with the shoulder complex and any restriction of motion at either of its joints is promptly reflected in the total range of motion at the shoulder.

2. The traditional conception as it serves as a prop is of little or no consequence, and excision of the bone leaves no significant disability. It serves, however, to give some stability to the extremity under load in the extreme ranges of motion.

3. Rotation of the clavicle about its long axis and its action of its outer curve as a crankshaft is its most important function, since this motion allows of one-half the total range of rotatory excursion of the scapula. The remaining half of scapula excursion is the outcome of clavicular elevation at the sternoclavicular joint. Loss of clavicular rotation completely restricts elevation of the arm above 120 degrees which is a serious disability in certain occupations and athletic pursuits.

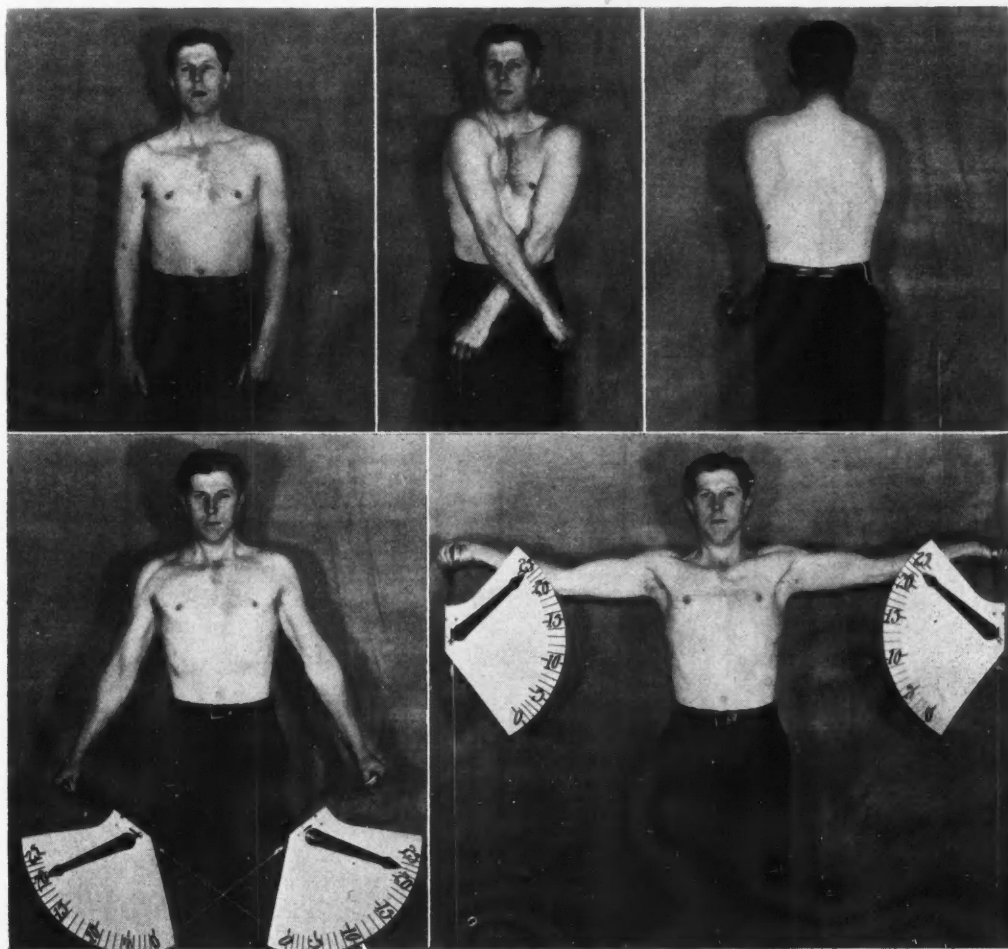


Figure 11.

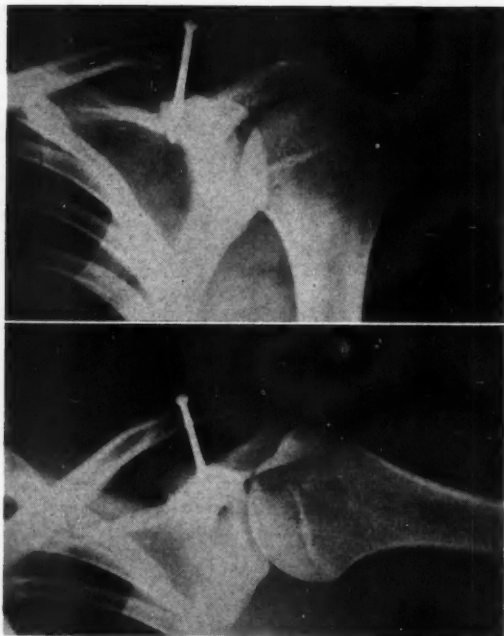


Figure 13.

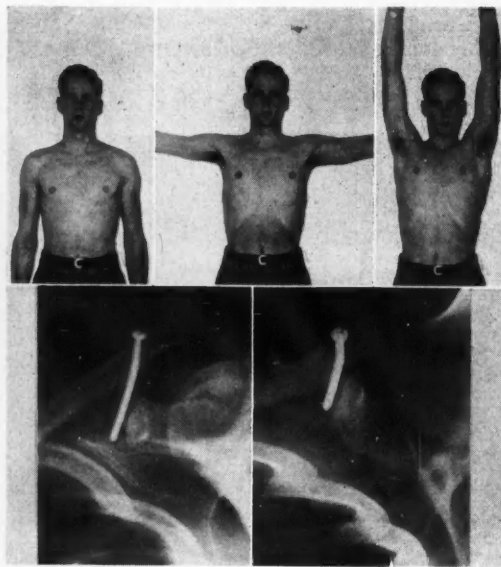


Figure 15.

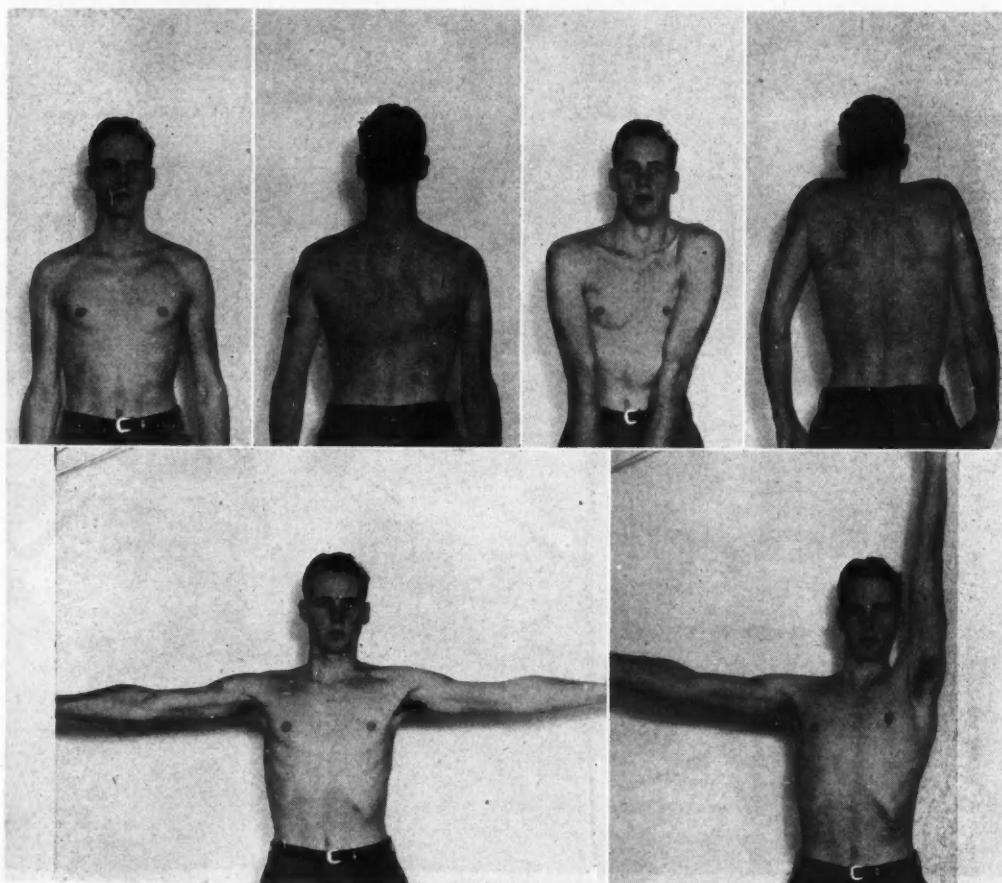


Figure 14.

Two Team Abdominoperineal Resection*

MALCOLM R. HILL, M.D., F.A.C.S., *Los Angeles*, AND ROBERT L. BELT, M.D., *Glendale*

WITH ever increasing interest in the surgical treatment of carcinoma of the rectum and rectosigmoid, there is still an apparent need of simplification of the operative procedure, even in the generally accepted Miles one stage resection.

It is the purpose of this presentation to evaluate the use of two operative teams in synchronous resection of the rectum and rectosigmoid through an abdominal and perineal approach using the Miles technique.

A review of the literature reveals that several writers in this field have given consideration to multiple simultaneous surgery in dealing with the treatment of cancer of the rectum and lower sigmoid. Bloodgood¹ in 1906, reported simultaneous surgery through an abdominal and sacral approach in attempting to completely remove carcinoma of the upper rectum and sigmoid colon with restoration of continuity. In 1934, Kirschner² reports what he designates as a new operation, in which he uses a double operative team in a one stage abdominosacral resection. Trueblood³ one year later, gives as a preliminary report his use of two simultaneous operations in the combined abdominoperineal resection. Mention is made that he failed to find evidence in surgical literature that this procedure has been previously used. Lloyd-Davies⁴ recommends the use of a combination of Trendelenburg and lithotomy positions with proper leg and back support as a prerequisite in synchronous abdominoperineal resection and resection with anal anastomosis. Laufman and Bettman⁵ in presenting a modification of the Lloyd-Davies technique, make an appeal for a more widespread use of the combined procedure as a means of broadening the field of operability in the treatment of cancer of the rectum. Wangenstein⁷ mentions that his associate completed a closed anastomosis through a Fansler operating proctoscope while he continued the abdominal part of the surgery.

TECHNICAL FACTORS

After the administration of the spinal anaesthetic, the patient is placed on the table (Figure 1) in the lithotomy position with the legs supported by right angle leg rests. A wide sand bag, four to five inches in thickness, is placed under the sacrum. The buttocks are placed three to five inches from the edge of the table. This allows optimum exposure of the ano-coccygeal and abdominal operative fields. Well padded shoulder

braces are used in maintaining the above position with Trendelenburg. One or both arms are placed above the head in a comfortable position which gives room for the surgeon and assistants. A left arm board may be used for intravenous therapy. In the male, the scrotum and catheter are held on the right thigh by means of a towel clip and adhesive. Continuous drainage of catheter may be maintained by connection to a floor basin. After surgical preparation, drapes are placed with minimal material in the pubic region. Instrument trays on stands can be placed over neck and legs. Lights are adjusted for each field of operation.

Exposure for simultaneous two team resection is made through a midline abdominal and a racket shaped peri-anal incision. The anus is closed by preliminary subcuticular linen ligation. During the first phase of the abdominal operative procedure the inferior mesenteric artery and vein are severed between clamps and ligated. After freeing the terminal bowel from both perineal and pelvic attachments the sigmoid colon is severed with cautery between de Martel clamps. The lower segment containing the neoplastic disease is then delivered by the perineal operator. The abdominal peritoneal floor is reconstructed and supported by packing from below into the pelvic wound using ten-yard roll of six-ply four-inch gauze which is kept from contact with any raw surface by an 18-inch square of rubber tissue. A permanent single barreled colostomy is placed in the midline abdominal incision which is closed about the colostomy, using interrupted figure of eight steel alloy suture to peritoneum and fascia, and skin clips. The colon is allowed to extrude three or more inches above the skin level to facili-

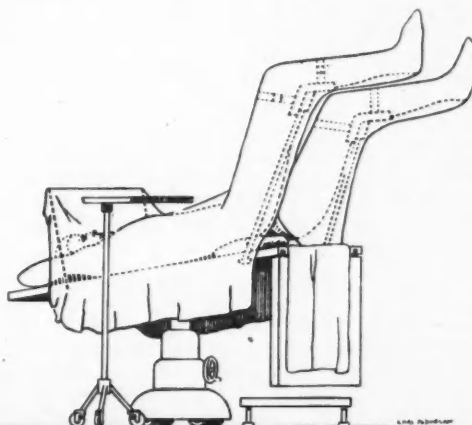


Figure 1.—Patient is placed in lithotomy position with Trendelenburg and complimentary elevation on sand bag under sacrum.

* Read before the Section on General Surgery at the Seventy-fifth Annual Session of the California Medical Association, Los Angeles, May 7-10, 1946.

From the Department of Proctology, College of Medical Evangelists.

tate in the "Dudley Smith Method" of bed side colostomy care. Preliminary to dismissal of the patient from the hospital the redundant bowel is removed with cautery.

CLINICAL DATA

A series of 30 cases in which the diagnosis of carcinoma of the rectum had been previously made and verified by biopsy, are presented. These individuals were subjected to surgical removal of their lesions by two operative teams working simultaneously through an abdominal and perineal approach following, more or less, the Miles technique. The age group varied from 35 to 76 years, with the predominance of 60 and above. Sex was equally divided. Two of these patients had known of their condition at least one year and were considered as being probably inoperable. The grading of tumors on hospital entry varied from II to IV, with predominance of grade II. Postoperative stay in the uncomplicated cases varied from ten to sixteen days. All patients were adequately trained in the care of their colostomy prior to departure from the hospital.

ADVANTAGES OF OPERATION

Certain distinct advantages are apparent in two team resection. There is no need for change of position; this not only saves time, but minimizes shock. In our experience, this time saved as compared with the Miles multiple operative procedure averaged about one hour. This approach simplifies the operative technique in that it allows more choice in procedure and facilitates in the dissection of fascial planes and attachments. This is readily illustrated in the perineal phase of the operation, in which the abdominal operator working out the cleavage planes between the prostate and rectum facilitates in the deep perineal dissection with less chance of injury to posterior urethra or rectum. Likewise, the retrorectal space can be more readily entered from below under guidance of a hand in the hollow of the sacrum. Synchronous operative procedure increases the operability of large adherent tumors which in many instances would be considered inoperable. The peritoneal pelvic floor is not only closed with more ease, but is supported with the proper amount of gauze packing placed from below into an 18-inch square of rubber tissue. Keeping the operative time between the one and two hour period holds it within the usual limits of one spinal anaesthetic. Supplementary or continuous spinal anaesthetics are seldom needed. All of these features encourage the use of this type of surgery in the elderly individual.

COMPLICATIONS

Complications arising during surgery were limited to ureteral injury and rupture of perforat-

ing bowel lesions. In two instances, the left ureter was involved. In one, some several inches of ureter had to be resected with tumor tissue. The severed ends were ligated to prevent urinary leakage. In the other case, a female, the left ureter was apparently injured in the dissection with subsequent urinary fistula into the pelvic wound. Before the patient left the hospital, the left kidney was removed. In two individuals, bowel leakage was observed in the abdominal phase of surgery, and in these peritoneal contamination was obviated by perineal operator being able to complete dissection from below; the peritoneal floor being closed over a soiled pelvic wound into which sulfa powder had been dusted.

Postoperative complications varied from urinary dysfunction, previously reported² by one of the authors, to ileus, pneumonia, pelvic abscess with cellulitis, and myocardial failure. One patient in this series suddenly expired ten minutes after return to her room. At no time during surgery was there any indication of shock. The operative time was limited to one hour. An autopsy revealed a coronary occlusion.

SUMMARY

1. Two team abdominoperineal resection has been carried out in a series of 30 cases.
2. Abdominal and perineal approach is made possible by use of a combination of lithotomy and Trendelenburg position with complimentary elevation of pelvis on sand bag placed under sacrum.
3. Synchronous operative resection of the rectum and rectosigmoid has several distinct advantages over the multiple stage abdominoperineal procedure using one operative team.

1216 Wilshire Boulevard, Los Angeles.
229 North Central Avenue, Glendale.

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The Responsibility of the Pediatrician In the Orthodontic Problem*

FRANCIS M. POTTINGER, JR., M.D., F.A.C.P., *Monrovia*

THE pediatrician has a large responsibility in preventing the development of an orthodontic problem in the growing child. It is he who can first observe in the infant the evidence of failure of development of the facial structures. When such failure is noted, the pediatrician can begin at once to institute measures to prevent or lessen future deformity which may require extensive oral correction. Although he cannot control the forces that developed the infant before birth, that being in large measure the internist's and obstetrician's responsibility, he can contribute a program of nutrition and care which will build strong, resistive oral structures with good alignment.

In this paper I shall discuss the leading post-natal influences which affect the growth and development of the facial structures and the teeth. The pediatrician who early takes roentgenograms of the head of the infant will be able to discover what density of bone is present, and what quality of supporting tissue. Subsequent x-rays of the head as the deciduous teeth appear will tell the pediatrician whether or not the anterior portion of the mandible will afford room for the permanent dentition. He can estimate the linear length of the bone supporting the deciduous teeth from second deciduous molar to second deciduous molar as the teeth emerge and determine from the breadth of the calcifying permanent teeth whether or not this portion of the jaw will be adequate.

Dr. Hays Nance,⁶ quoting from the work of John Hunter, states that this distance is determined by the end of the first year. In observing children in my own practice, I have felt that failure to expand the dental ridges and interdental bone of the anterior portion of the mandible by the third year omened permanent failure in this development. The pediatrician who discovers that the infant's jaw is failing to expand linearly by the last half of his first year is faced with the problem of that child's future tooth development, and his potential requirement of orthodontic assistance.

The linear difference between the space needed for the ten deciduous teeth, and the linear length of the alveolar and interdental bone needed for the ten permanent teeth replacing them, will determine, in a large measure, the amount of deformity in alignment to be expected when the permanent central, lateral, cuspid and bicuspid teeth appear.

A child of five possessing small deciduous teeth

and little expansion of the alveolar crests of the jaw, yet whose x-rays show large permanent teeth with a greater total linear requirement than the corresponding deciduous teeth already present, cannot fail to develop a malalignment of his permanent dentition. He will probably require extraction in order to make it possible for future orthodontic correction to improve facial appearance or to hold when the appliances are removed.

The linear growth of the posterior portion of the mandible that supports the permanent molars continues to a later date. The most common and almost universal failure of spacing for the third molar among civilized peoples is but one index of inadequate development of the jaw bone.

If a pediatrician evaluated the relative effects of the muscular action of a baby nursing at the breast and of one nursing from a bottle, he would weigh more carefully the wisdom of placing an infant on a bottle. In accordance with Wolff's law, the vigor of the nursing infant and the resistance of the nipple to his effort determine how strong the important muscles of mastication will be. The pull of these muscles acts on their attachments and develops the accompanying bones of the skull and mandible in proportion to the force exerted. Nursing the breast requires a different muscular action and more effort on the part of the infant than nursing from a rubber substitute.

Not only must we consider the growth of the mandible, but we must study the factors in the development of the middle third of the face and the base of the brain, which determine the adequacy of lateral and forward movement of the face. This development determines the direction of the muscular pulls on the oral structures and influences the size and shape of the arches and vault of the mouth, and secondarily, the sinuses of the skull.

Two very important indices of this development are the adequacy of the orbital portion of the zygomatic arch (process fronto-sphenoidalis) and the maxillotemporal portion of the zygomatic arch. In the well developed child, the transverse diameter of the two malar prominences should be equal to, or slightly greater than, the transverse diameter of the fronto-sphenoidal processes.

Most bottle fed infants early show failure of the growth between the malar prominences and a failure in development of an adequate orbital portion of the zygomatic arch. This is partially due to the weakness of muscles common to many bottle fed infants.

During the greater part of the first year, the bones of the face are the only bones subjected to stress—the stress of nursing and chewing. The

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author has pointed out^{7,8} that metabolic upsets such as infectious diseases leave their imprint on developing bones under stress. The recurrent upsets of an allergic process leave even greater effects. As the child begins to walk, the foot and the knee and hip become bones of stress, and evidence of fragmentation in any of these can be interpreted as an index of disturbed dental development.

It is therefore logical that the severely allergic child with his recurrent allergic episodes is likely to experience failure in facio-dental development. It is very important to control the allergic process as quickly as possible to prevent the occurrence of dental deformity. In my own experience, some evidence of failure in alignment or development of the teeth is present in every case of persistent childhood allergy.

Congenital failure in development as well as post-natal injury of other facial structures may exert a definite effect on the developing face. An example of this is the lack of stimulation to growth found in the congenitally blind.

Infections of the nasal passages can also exert an arresting effect on the growing bones of the face and may permanently interfere with occlusion. Failure in the dental structures, especially in the deciduous teeth afflicted with rampant caries, which are now known to be controllable by adequate diets^{9,10,11,12} may not only ruin an otherwise good mouth but may leave a badly scarred area of little use to the orthodontist and a difficult problem to the prosthodontist. The early loss of teeth interferes with the full development of the alveolar bones and their supporting structures, when due to extensive decay.

The mechanical factors of injury can play havoc with the growing face and the occlusion of the teeth, as can the direct infection of the mandible or maxilla from abscesses. Burns of all types can damage the growth of the facial and dental structures, but are relatively few as compared with injurious factors of disturbed metabolism.

The pediatrician has a particular responsibility in recognizing the hypothyroid child and instituting early treatment. These children, when they reach adult life, often suffer loss of teeth due to porosity of bone, and extensive root resorption.¹ Orthodontia in these cases is apt to fail because of the same porous bony structure which cannot support appliances or retain good alignment, however well executed.

The hypogonad child^{2,3} frequently presents a concomitant symptom of missing teeth in either or both the deciduous and permanent dentition. He may show underdevelopment of both mandible

and maxilla. The proper stimulation of the gonads at an early date will also improve the facio-dental development. In a similar manner other endocrine disturbances,^{4,5} especially of the pituitary, should be recognized in early childhood and the proper treatment instituted.

The pediatrician thus undertakes a double trust in assuming the guidance of the health of an infant. He not only treats the infant for infectious diseases and prescribes a diet to meet its growing needs; he directs a program calculated to determine the future dental development of that child.

He can determine by routine x-rays the changing conditions of the skull, and can interpret these findings as prophesies of future requirement for orthodontia. By encouraging the mother to nurse the infant, the pediatrician can early help the child to develop strong facio-dental structures entirely different from those of the bottle fed baby. He can avert or lessen many a dental deformity by recognizing early hypogonad, hypothyroid, and other endocrine disturbances of children and by instituting the proper therapy which, in turn, improves the facio-dental structures. He can also obviate many serious dental problems by checking allergies as quickly as possible, since the continual insult of an allergic process is accompanied by concomitant dental problems. The pediatrician, by means of x-rays taken at regular intervals, should anticipate the future development of orthodontic problems, so that the orthodontist may be consulted at an early date, before the permanent teeth have erupted.

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MEDICAL PROGRESS:

Present Concepts of the Clinical Significance of Unipolar Precordial Electrocardiograms†

MAURICE SOKOLOV, M.D.,* *San Francisco*

ACCUMULATED experience, supported by animal experimentation, has emphasized the importance of precordial leads in clinical electrocardiography. Many physicians regard precordial leads only as a research tool and their use far too complicated for ordinary clinical study. Recently Wilson, et al.,²⁵ Goldberger,⁷⁻¹³ and Sodi²⁴ have discussed the physiologic concepts and electrocardiographic correlations and have conclusively demonstrated the clinical value of precordial leads.

The standard limb leads are indirect leads and the data they furnish are not comparable to those obtained by direct leads from the epicardium in animals. The standard limb leads are bipolar leads and record the composite differences in potential of two unipolar extremity leads and not that of a single extremity. The standard leads, therefore, reflect the contribution of all portions of the heart, and the effects of small lesions may be overshadowed by the effect of the great mass of normal myocardium. A detailed analysis of precordial leads gives one data comparable to those from direct epicardial leads, the precordial leads being semi-direct leads and not indirect, as are the limb leads. Further, even though limb leads may indicate that myocardial abnormality is present, multiple precordial leads delineate the abnormality more finely and indicate its extent. Precordial leads may reveal localized lesions such as antero-septal or antero-apical myocardial infarction, when limb leads may not be diagnostic. A single precordial lead has the disadvantage of reflecting potential variations solely of that portion of the heart which lies under the electrode. With the common use of a single electrode on the cardiac lead apex (IV F), the problem of accurately locating the exact site of the apex for serial records becomes most important. In addition, precordial leads further to the left of the cardiac apex may reveal abnormalities not seen in leads from the apex (IV F), especially if the heart is enlarged. For this reason Lead IV F is frequently inadequate. Even in normal electrocardiograms, the presence of six normal precordial leads taken over both ventricles is an added assurance of normality and removes the doubt that a localized lesion may be present that was missed in the standard limb leads. Multiple precordial leads are now more extensively used, especially by insurance companies, and if reliance

is placed solely on the results furnished by a single precordial lead, electrocardiography is not utilized to its fullest diagnostic possibilities.

PHYSIOLOGIC CONSIDERATIONS

Lewis²⁰ first showed that by pairing an electrode over the ventricular surface (exploring electrode) with one over the chest wall or over an extremity (indifferent electrode), electrocardiograms were obtained which reflected directly the activity of the part of the heart under the electrode. Wilson, et al.^{16, 26, 27, 28} showed by numerous experiments on normal dogs, and on dogs with induced bundle branch block and with myocardial infarction that a close relation exists—as demonstrated electrocardiographically—between the potential variations of the right side of the precordium and those of the anterior surface of the right ventricle, and between the potential variations of the left precordium and those of the anterior surface of the left ventricle. These correlations were based on comparison of the QRS complexes of precordial leads with the chest intact and later with direct epicardial leads after the heart was exposed by splitting the sternum. These experiments allow one to conclude that precordial leads are, in effect, semi-direct leads from the heart, and that leads from the right precordium reflect activities of the right ventricle and leads from the left precordium reflect activities of the left ventricle.

The potential variations of a given precordial electrode are largely determined by the potential variations of the ventricular surface nearest the electrode. The part of the heart directly under the exploring electrode exerts the major effect on the electrocardiogram and the effects of distant ventricular surfaces are relatively minor, since the magnitude of the contribution of other portions of the heart varies inversely with the cube of the distance.²⁵ This being so, moving the electrode across the precordium in multiple leads enables one to record the potential variations from different parts of both ventricles, and therefore to determine the presence of lesions localized to one part of the heart. The fact that a single precordial lead reflects chiefly the electric activity of a limited part of the heart is one of the main reasons for the necessity of taking more than one precordial lead.^{29, 31}

During a cardiac cycle the potential variations produced by the heart are transmitted to all parts of the body in diminishing degree, depending on the distance from the heart. It has been estimated that the potential variations of the arms or legs are one-thirtieth as great at any given time as those at a point on the ventricular surface.²⁵ Nevertheless, the extremity used for the indifferent electrode possesses sufficient electric potential so as to influence to some degree the form of the ventricular complex obtained by precordial leads. Because of the effect, although small, of the "indifferent" electrode on the precordial tracing, Wilson, et al.,²⁷ introduced a method of reducing the potential of the indifferent electrode to zero. This method involved the construction and use of the "central terminal." The central terminal consists of three lead wires, each connected to a 5,000 ohm resistance, and all joined to a central terminal. Since, according to Einthoven's law, the sum of the potentials of the three extremities at any moment in the cardiac

* From the Division of Medicine, University of California Medical School, San Francisco. Assistant Professor of Medicine.

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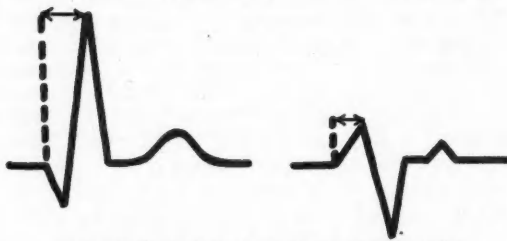
cycle is zero, the potential of the central terminal is zero. Goldberger¹¹ simplified Wilson's apparatus by eliminating the 5,000 ohm resistance. Using either Wilson's or Goldberger's terminal as the site of the indifferent electrode, Wilson has shown that with the exploring electrode over the precordium, unipolar precordial leads could be obtained which are in effect semi-direct leads from the heart. The potential variations reflected in the electrocardiogram are not influenced by the indifferent electrode with zero potential and so the unipolar precordial leads give data that are comparable to those obtained with direct leads from the heart. In the illustrations presented in this paper the Goldberger terminal was used.

The normal spread of the cardiac impulse through the heart is from the endocardium outward to the epicardium. The septum is activated from both sides simultaneously, although Goldberger believes the left is activated first. The positive pole of a wave of excitation is in the direction to which the impulse is spreading, and the negative pole is in the direction from which the impulse is passing.²¹ Since an area from which the activation wave proceeds or one facing the end of the wave is negative, the ventricular cavities normally possess a negative potential. An electrode on the epicardium, however, faces an oncoming wave of excitation and therefore records an initial positive potential. The electrocardiographic tracing is so adjusted that the positive potential is shown by an upward deflection (R wave) while a negative potential has a downward deflection (Q or S wave). An epicardial electrode may not only face an oncoming excitation wave and so have an initial positivity (R wave) but it may later face the end of the spreading wave of excitation in some other part of the heart and record a negative potential (S wave). If the electrode faces the end of a wave that is activating another portion of the heart prior to activation of the muscle directly under the electrode, the electrocardiogram will record an initial negative deflection, or Q wave. Therefore the form of the QRS complex in precordial leads depends on the spread of the excitation wave, and whether the precordial electrodes face the beginning or the end of the wave of excitation at different periods during the QRS interval.

THE CONCEPT OF THE INTRINSIC DEFLECTION

Wilson, et al.,²⁵ and Sodi,²⁴ have emphasized the importance of the intrinsic deflection. In normal subjects, the QRS complex displays an abrupt downward deflection, corresponding to the intrinsic deflection of direct ventricular leads. This abrupt downstroke indicates that the epicardial surface of the anterior ventricular wall underneath the exploring electrode has been activated by the cardiac impulse and the wave of excitation has passed. Since the activation wave in the heart spreads from the endocardium to the epicardium, the time interval between the onset of QRS and the peak of R (or beginning of the downstroke of the intrinsic deflection) gives information regarding hypertrophy or defects in conduction in the area of the heart studied. The intrinsic deflection appears early in the QRS interval in leads from the right precordium because of the relative thinness of the wall of the right ventricle. The intrinsic deflection appears late in the QRS interval in leads from the left precordium because of the relative thickness of the left ventricle. As will be discussed later, this fact is of great importance when ventricular hypertrophy and bundle branch block are considered. Figure 1 illustrates the method of determining

the time of onset of the intrinsic deflection. The onset of the intrinsic deflection is preceded by an upward stroke of variable amplitude due to the spread of the activation wave through the ventricular wall from the endocardium to the underlying epicardium. The pre-intrinsic upward deflection (positive or plus polarity) prior to the onset of the intrinsic deflection may or may not be preceded by a Q wave. If the intrinsic deflection occurs early in the QRS interval (right pre-



INTRINSIC DEFLECTION

Fig. 1.—Method of measuring the onset of the intrinsic deflection.

cordium), there may be a postintrinsic downward deflection (S wave) as the beam crosses the isoelectric line. This is due to the subsequent activation of ventricular muscle adjacent to and distant from that underlying the exploring electrode. When the epicardial surface under the electrode represents the last portion of the ventricular muscle to be activated (left precordium), there usually is no postintrinsic S wave. Therefore, the size of R and S waves in precordial leads is related to the time of onset of the intrinsic deflection: When the onset of this deflection is early, R is small and S is deep; when it occurs later, R is tall and S may be small or absent.

THE NORMAL PRECORDIAL ELECTOCARDIOGRAM

Some years ago a committee of the American Heart Association for Standardization of Precordial Leads¹ advocated six positions on the precordium from which precordial leads could be taken so as to reflect the activities of both the right and left ventricles. In addition, they proposed the use of one of four sites for indifferent electrodes, namely, the right arm, left arm, left leg, or central terminal. They suggested that precordial or chest leads be labeled C, with a second letter added—depending on the site of the indifferent electrode—such as CF for left leg, CR for right arm, and CL for left arm. As one takes leads across the precordium from right to left, the various positions are numbered one through six, and a lead, labeled, for example, CF II, indicates a chest lead with the exploring electrode in position two and the indifferent electrode on the left leg. If unipolar precordial leads are taken, they are labeled V leads. The six positions are illustrated in the diagram of Figure 2.

Unipolar precordial leads, then, are those in which the indifferent electrode is attached not to an extremity as in ordinary precordial leads (CF, CR, CL) but to a central terminal whose poten-

tial is essentially zero. When the exploring electrode is placed on an *extremity* instead of the heart, and the indifferent electrode is attached to the central terminal, one has a unipolar *limb* lead in which the potential variations solely of the limb involved are recorded.

Although unipolar precordial leads are preferable to precordial leads in which the indifferent electrode is placed on an extremity and not in a

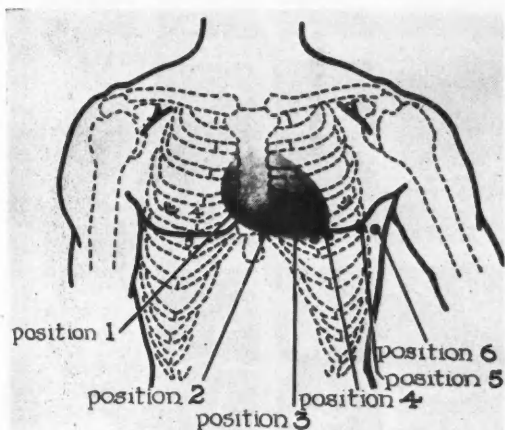


Fig. 2.—Diagrammatic sketch illustrating the six precordial positions.

central terminal of zero potential, the ordinary precordial leads are adequate for clinical purposes. Further, most electrocardiographic machines do not have the central terminal attachment although it can be purchased, or a simple unit such as described by Goldberger¹¹ can be inexpensively made. Unipolar precordial leads are simple to take, and no more difficult than ordinary precordial leads.

TABLE 1.—Normal Precordial Leads

1. P wave may be upright, diphasic or inverted.
2. Q wave is absent in V_1 and V_2 , variable in V_3 , usually present in V_4 and V_5 . Maximum normal is 3 mm.
3. R wave is small in V_1 and is progressively larger up to V_4 , when it gradually decreases in size to V_6 .
4. S wave is deep in V_1 and is gradually smaller as the left side of the precordium is approached. It may be absent in V_5 and V_6 .
5. T wave may be inverted or upright in V_1 , variable in V_2 , and progressively taller with maximum height in V_4 . It then decreases and may be low in V_5 . In children, T may be inverted in V_1 to V_4 , but is usually upright in V_5 and V_6 .
6. The transitional zone between the right and left side of the precordium is usually V_3 , but this is variable and it may be V_2 or V_4 , or the zone may include several positions.

Table 1 summarizes the features of the normal precordial electrocardiogram in adults using unipolar leads.^{3, 5-13, 17, 23-25, 30} It will be seen in Figure 3 that in leads from the right precordium (V_1 and V_2), R is small and may be absent, S is deep, and the intrinsic deflection (peak of R coinciding with abrupt downward deflection QRS) occurs relatively early in the QRS interval. These complexes are similar to those obtained in direct leads from the anterior wall of the thin right

ventricle of the dog. In leads from the left precordium (V_5 and V_6), R is tall and S is small and the intrinsic deflection occurs late in the QRS interval. These complexes are similar to those obtained in direct leads from the anterior wall of the thicker left ventricle of the dog. Q waves may appear normally in V_5 and V_6 and occasionally in V_4 , but never exceed .03 second in duration and are less than 25 per cent of the R wave in the same lead. The peak of R occurs, according to Kossman and Johnston,¹⁹ an average of .02 second later in left precordial than in right precordial leads. The absolute upper limits of normal for the intrinsic deflection in various precordial leads have not been established, but .04 second is considered maximum for the left precordium, and .02 second for the right precordium V_1 .

The size and form of R and S waves in the intermediary zones between the right and left precordium (V_3 and V_4) are variable in normal individuals. There is a progressive increase in size of R from V_1 to V_4 as the precordial electrode is moved across the chest from the area of the thinner right ventricle (V_1) to the area of the thicker left ventricle. The maximum R may be in V_5 . As the electrode is moved beyond the left lateral border of the heart, R becomes smaller and may be small in V_6 . The peak of the R wave occurs less than .02 second after the onset of QRS in V_1 and V_2 , but progressively appears later in the QRS interval, so as to be .03 to .04 second in V_5 and V_6 . The amplitude of the T wave follows the changes noted above in the R wave but the S wave is inversely proportional. The S wave is deepest in V_1 and V_2 and gradually becomes smaller and may be absent in V_6 and V_5 and perhaps in V_4 . The T wave may be inverted in V_1 and perhaps in V_2 and is frequently flat or very low in V_6 . In children, T may be inverted in V_1 to V_4 , but usually it is normally upright in V_5 and V_6 .

UNIPOLAR LIMB LEADS AND THE ELECTROCARDIOGRAPHIC POSITIONS OF THE HEART

Wilson, et al.,²⁵ have indicated that the anatomic and the electrocardiographic positions of the heart, while usually similar in normal subjects, may differ in patients with abnormal hearts. They have shown that some unusual or atypical patterns of ventricular hypertrophy, bundle branch block, and perhaps myocardial infarction in standard limb leads may be due to the electrocardiographic position of the heart. They have demonstrated that the precordial patterns of these conditions are not influenced by the mean electric axis, while the standard limb leads may be strikingly different, depending on the electric axis. Since the potential variations of an extremity are dependent upon, and similar to, that portion of the heart to which the extremity is directed, it is possible, by comparing the ventricular complexes of the extremities (by means of unipolar limb leads) with those of the right and left precordium, to analyze the spatial relationship between the surfaces of the two ventricles and the limbs. In this way one may visualize the relative position

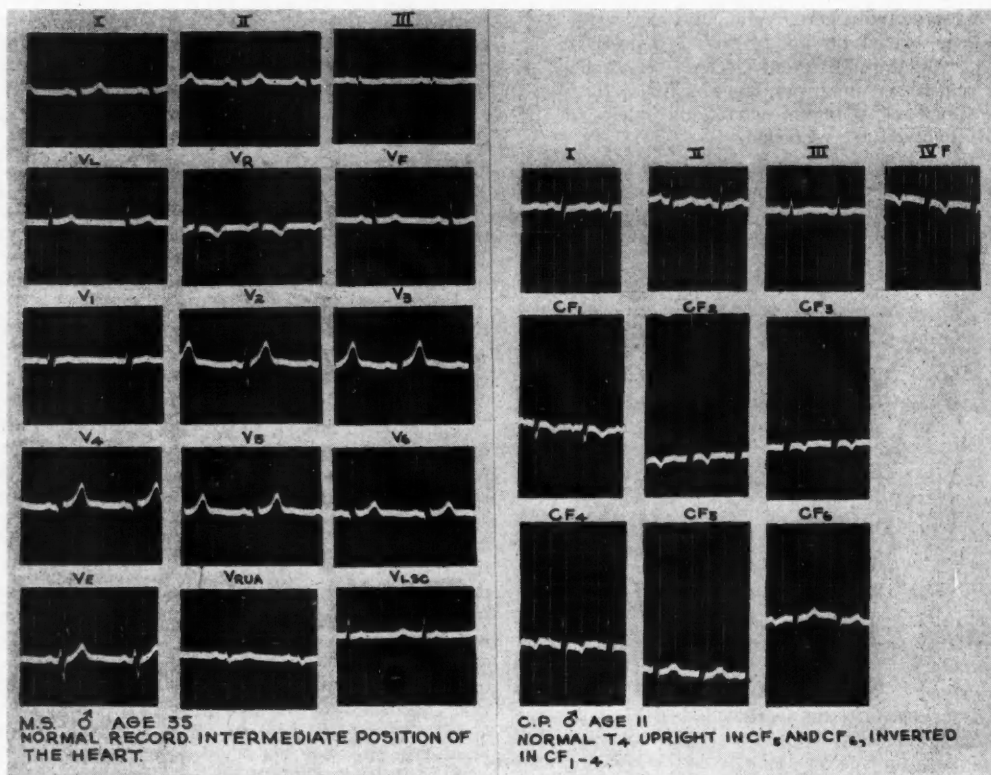


Fig. 3.—The normal precordial electrocardiogram. The Goldberger central terminal was used in this and the following illustrations.

of the heart from an electrocardiographic standpoint. In unipolar limb and precordial leads, if VL (left arm) resembles V₅ or V₆, the potential variations of the left ventricle have been transmitted to the left arm. This enables one to visualize that the heart is horizontal in position and this is further supported by noting that VF (left leg) resembles V₁ and V₂, indicating that the potential variations of the right precordium are transmitted to the left leg. Individuals with horizontal hearts usually have left axis deviation in the standard limb leads. If VL resembles V₁ or V₂ and VF resembles V₅ and V₆, it is apparent that the heart has rotated in such a manner that the potential variations of the left precordium are transmitted to the left leg and those of the right precordium to the left arm. The heart, therefore, is in the vertical position. Individuals with vertical hearts usually have right axis deviation in the standard limb leads. On the basis of these assumptions, Wilson has summarized five basic electrocardiographic positions of the heart (Table 2). In normal subjects one can demonstrate the relationship between right axis deviation and vertical hearts and between left axis deviation and horizontal hearts. For the purpose of this article, the main value of unipolar limb leads lies in the fact that the electrocardiographic position of the heart can be determined, thereby aiding in the interpretation of the

TABLE 2.—*Electrocardiographic Positions of the Heart*

Vertical Position	
1.	Ventricular complexes of VL resemble those of the right side of the precordium (V ₅ , V ₆).
2.	Ventricular complexes of VF resemble those of the left side of the precordium (V ₁ , V ₂).
Semi-vertical Position	
1.	Ventricular complexes of VF resemble those of the left side of the precordium (V ₅ , V ₆).
2.	Ventricular complexes of VL are small.
Intermediate Position	
The ventricular complexes of VL and VF are similar in size and form, and resemble those of the left side of the precordium (V ₅ , V ₆).	
Semi-horizontal Position	
1.	The ventricular complexes of VL resemble those of the left side of the precordium (V ₅ , V ₆).
2.	The ventricular complexes of VF are small.
Horizontal Position	
1.	The ventricular complexes of VL resemble those of the left side of the precordium (V ₅ , V ₆).
2.	The ventricular complexes of VF resemble those of the right side of the precordium (V ₁ , V ₂).
Indeterminate	

electrocardiographic patterns that otherwise would be considered atypical.

ELECTROCARDIOGRAPHIC PATTERNS

Bundle Branch Block

Unipolar precordial leads have greatly expanded and clarified our knowledge of bundle branch block. Various terminology has been used in the past in an attempt to explain the apparent varieties of branch block as seen in standard limb leads. This has led to some confusion. Wilson's

studies, however, have shown that the many variations in the patterns in standard limb leads depend not only on the branch of the bundle of His that is blocked, but also on the electrocardiographic position of the heart. Since the relations between the surfaces of the two ventricles and the extremities vary with the position of the heart, the pattern in the limb leads will vary in different patients with the same type of bundle branch block, depending upon the position of the heart. Thus unipolar limb leads in patients with suspected bundle branch block permit one to visualize the electrocardiographic position of the heart by noting to which extremity the potential variations of the right and left ventricle are transmitted. Unipolar precordial leads indicate which ventricle is activated late, hence indicating its bundle has been blocked. As already stated, the time of onset of the intrinsic deflection (peak of R) in relation to the onset of QRS allows one to determine the time of spread of the impulse from the endocardium to the epicardium. Therefore if the intrinsic deflection is markedly delayed in leads from the left precordium, a left bundle branch block is present, and if delayed over the right precordium, a right bundle branch block. This is true regardless of the axis deviation in the limb leads, which simply reflects the electrocardiographic position of the heart. Thus we may have a right bundle branch block with either right, left, or no axis deviation.

By correlating the effects of experimentally induced bundle branch block in dogs and those found in human subjects, Wilson concluded that a diagnosis of which bundle is blocked can often be made solely from inspection of the standard Lead I. Thus, a right bundle branch block is characterized by a QRS interval of .12 second or more with a biphasic or triphasic QRS complex and a definitive S wave that is broad, slurred, or notched. A left bundle branch block shows a QRS interval of .12 second or more, and a QRS complex that is monophasic, not associated with an S wave, and with a broad, slurred or bifid R. In doubtful cases, unipolar precordial leads will be decisive and will demonstrate marked delay in the appearance of the intrinsic deflection, depending on which ventricular surface is activated late. We have seen cases of right bundle branch block in which the QRS interval in the limb leads did not exceed .10 second, with a small Q and S wave in Lead I.

Goldberger⁸ has emphasized the importance of "W" and "M" shaped QRS complexes in the diagnosis of bundle branch block by precordial leads. The "M" shaped QRS complexes—which, in our experience, are more consistently found—are present in precordial leads over the delayed ventricle, while the "W" shaped complexes are present over the normal ventricle. Thus in left bundle branch block, V₅ and V₆ will show "M" shaped, monophasic QRS complexes. The explanation lies in the mode of passage of the activation wave through the interventricular septum. In left bundle branch block, in leads V₅ and V₆, the first upstroke of R represents the initial positivity of the

left ventricular cavity while the electric impulse is passing through the septum from right to left; the second upstroke represents the late activation of the left ventricular muscle.

The first region to be activated in left bundle branch block is the right side of the septum. The impulse then passes through the septum to the left, thus producing an initial positivity in the leads facing the oncoming excitation wave, i.e., the leads facing the left side of the septum (V₅ and V₆). The leads facing the end of the wave have an initial negativity, i.e., the leads facing the right side of the septum (V₁ and V₂). The wave of excitation then spreads through the right ventricle and the negative wave in V₁ and V₂ terminates. As the wave spreads through the right ventricle, leads from the left side of the heart (V₅ and V₆) face the end of the wave and record a negative deflection (the first downstroke of the "M"). This downstroke is interrupted by the beginning of the spread of the wave of excitation through the left ventricle which had been delayed by passage of the impulse from right to left through the septum. With left ventricular activation, V₅ and V₆ now face an oncoming wave of activation and record a positive deflection, the second upstroke of the "M." At this time leads from the right ventricle, V₁ and V₂ face the end of the left ventricular wave and record the second negative deflection, or second downstroke of the "W." When the wave of activation reaches the epicardial surface under the exploring electrodes of V₅ and V₆, the intrinsic downward deflection occurs in V₅ and V₆, recording the final downstroke of the "M." Because of the initial positivity of the left ventricular cavity, the first deflection in left bundle branch block is upright or an R wave. The presence of Q waves in left ventricular leads in left bundle branch block either means that the diagnosis is in error and that a marked left ventricular hypertrophy is present, or one must assume a septal lesion with a "physiologic hole" so that the negative potential of the right ventricular cavity is directly transmitted to the left ventricular cavity.

TABLE 3.—Left Bundle Branch Block

1. QRS interval is .12 second or more.
2. QRS in Lead I is monophasic with broad, slurred or bifid R wave.
3. Axis deviation in limb leads depends on the position of the heart.
4. "M" shaped complexes with intrinsic deflection occurs late in the QRS interval (.06 to .10 second) in leads from the left side of the precordium.
5. "W" shaped complexes occur with small or absent R waves in leads from the right side of the precordium.
6. Q wave is absent in leads from the left side of the precordium except when septal lesions are present.

TABLE 4.—Right Bundle Branch Block

1. QRS interval is .12 second or more.
2. QRS complex in Lead I is biphasic or triphasic, ending with a broad, slurred or notched S wave.
3. Axis deviation depends on the position of the heart.
4. "M" shaped complexes with intrinsic deflection occur late in the QRS interval in leads from the right side of the precordium.
5. "W" shaped complexes with small R and prominent S waves occur in leads from the left side of the precordium.

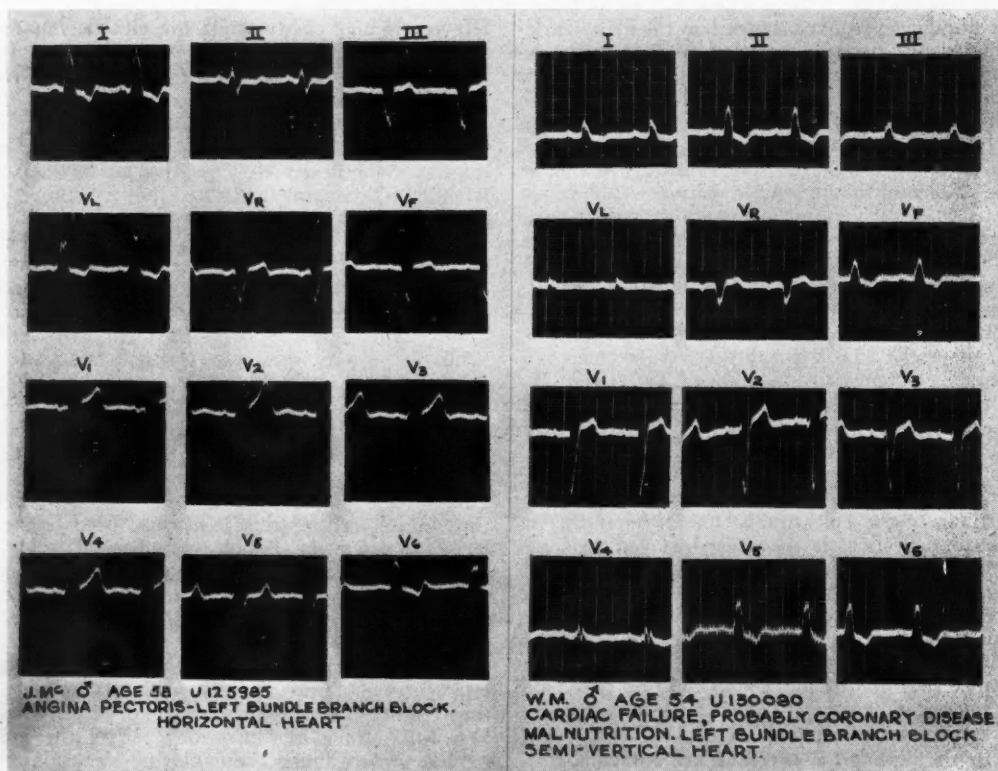


Fig. 4.—Left bundle branch block.

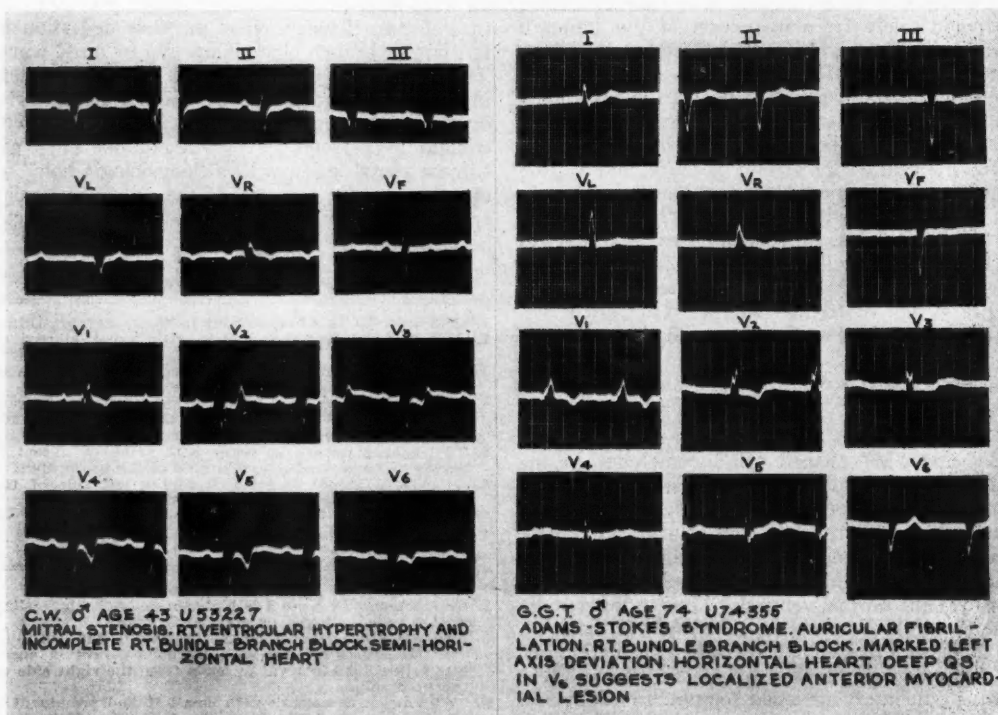


Fig. 5.—Right bundle branch block.

The description of the electric events in left bundle branch block can be reversed in right bundle branch block, replacing left with right and V_5 and V_6 with V_1 and V_2 .

Tables 3 and 4 summarize the findings in bundle branch block and figures 4 and 5 illustrate bundle branch block in various electrocardiographic positions.

Ventricular Hypertrophy

Precordial leads in ventricular hypertrophy are not so bizarre as in bundle branch block but reflect the increased thickness and size of the ventricular walls. Again, the electrocardiographic position of the heart varies the pattern seen in the standard limb leads, so that one may see a variety of patterns in these leads while the precordial leads follow a single pattern, regardless of the position of the heart. The common pattern

trophy in order to demonstrate how the position of the heart may vary the pattern in the electrocardiogram of the standard limb lead.

In left ventricular hypertrophy, because of the increased mass of the left ventricular muscle, the QRS interval approaches .10 or .11 second, the voltage of the QRS in the left precordial leads may be greater than normal, and the onset of the intrinsic deflection in left precordial leads is usually delayed, both absolutely and in relation to the time of onset of the intrinsic deflection in right precordial leads. In leads V_5 and V_6 and occasionally in V_4 , the intrinsic deflection usually exceeds .04 second, and commonly is .06 second, indicating delay in the time required for the impulse to pass from the endocardium through the hypertrophied muscle to the epicardium of the left ventricle. We have seen cases of left ventricular

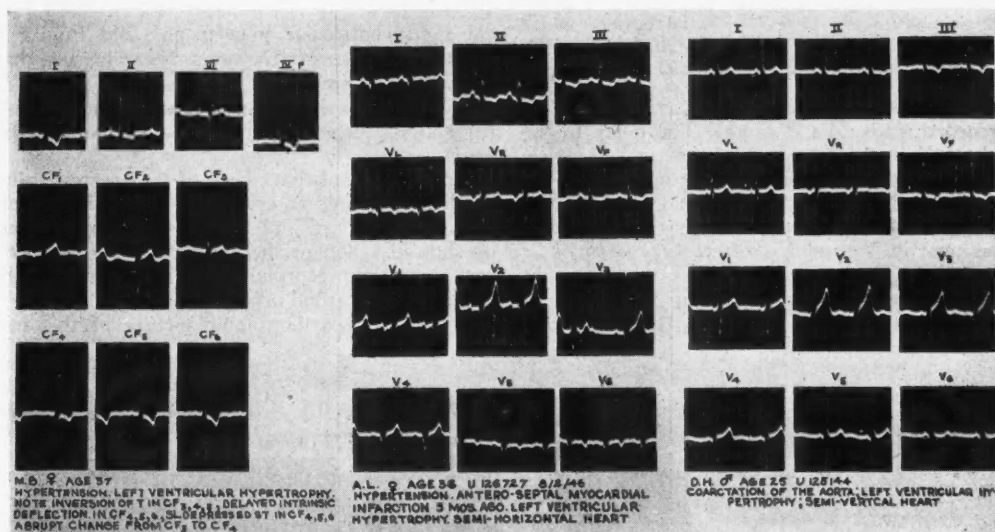


Fig. 6.—Left ventricular hypertrophy.

of left ventricular hypertrophy described by Barnes,² by Katz,¹⁸ and by Gubner and Ungerleider¹⁴ occurs in horizontal or semi-horizontal hearts. Since horizontal hearts are those most frequently found in patients with left ventricular hypertrophy, the combination of marked left axis deviation, high voltage R-1 and S-3 and later ST-T changes in Lead I, has come to be recognized as most typical of left ventricular hypertrophy. However, in vertical or semi-vertical hearts with left ventricular hypertrophy, this pattern is not present; there may even be right axis deviation, and the interpretation of the electrocardiogram has often been incorrect. Studies of these cases, however, reveal precordial leads similar to those obtained in patients in whom the standard limb leads showed the characteristic common pattern of left ventricular hypertrophy. It is necessary, therefore, to study the standard limb leads in conjunction with precordial and unipolar limb leads in patients with such a hyper-

trophy, proved by roentgenologic examination, in which the onset of the intrinsic deflection did not exceed .04 second. It is apparent that not all of the typical features need be present in all cases. The precordial tracings of left ventricular hypertrophy differ from left bundle branch block in leads V_4 , V_5 , V_6 , in that Q waves are commonly seen, the R wave is not appreciably slurred nor notched and the QRS complex rarely exceeds .11 second. There are some borderline transitional cases, where one may have difficulty identifying *incomplete* bundle branch block. The ST interval may be depressed and the T wave may be inverted in left ventricular hypertrophy. These ST-T changes have been attributed to anoxemia of the anterolateral wall of the left ventricle.⁴ These ST-T wave changes may be seen only in V_5 or V_6 and may be missed if only one (IV F) precordial lead is taken. Figure 6 is representative of left ventricular hypertrophy and Table 5 tabulates the typical diagnostic findings.

In right ventricular hypertrophy, the increased thickness of the right ventricular wall tends to decrease the difference between it and the left ventricular wall. The voltage and duration of R in right precordial leads increase, although they rarely approach the size of R in left precordial leads. The intrinsic deflection in right precordial leads (V_1 , V_2) is delayed, exceeding .02 second, often approaching .04 to .06 second, and it may

TABLE 5.—Left Ventricular Hypertrophy

1. Increased voltage of QRS is present in both limb and precordial leads; R_1 plus S_1 equals or exceeds 25 mm.
2. ST₁ is depressed, and T₁ is low to inverted.
3. Axis deviation depends on the position of the heart, left if horizontal, and right or none, if vertical or semi-vertical.
4. In vertical hearts, R_2 and R_3 are tall with diphasic or inverted T₂ and T₃.
5. QRS duration is .10 to .11 second.
6. R waves are small or absent in leads from the right side of the precordium (V_1 , V_2 , perhaps V_3).
7. Delayed intrinsic deflection occurs in leads from the left side of the precordium (V_4 , V_5).
8. T wave is inverted in leads from the left side of the precordium (V_4 , V_5), and ST is displaced in the same direction as the T wave.

equal or exceed the intrinsic deflection from left precordial leads (V_4 , V_5 , V_6). The delay in the peak of R in these leads over the right ventricle is due to the increased time required for the spread of the wave of activation through the hypertrophied right ventricle. S waves, normally prominent in V_1 and V_2 , often become small or are absent. The record resembles that of right bundle branch block, especially in marked right ventricular hypertrophy, but the QRS is less than

.12 second, the R waves are not broad and notched, and there may be Q waves in V_1 , V_2 and V_3 . The T waves may be inverted in V_1 and V_2 , but since this may occur normally, it is of lesser diagnostic significance. When the inverted T waves are accompanied by a depressed ST interval in the same leads, they are of greater diagnostic significance. In left precordial leads, S may be prominent and R is usually relatively smaller than normal. Table 6 tabulates the findings in typi-

TABLE 6.—Right Ventricular Hypertrophy

1. Axis deviation depends on the position of the heart; usually right with a vertical heart.
2. R_2 and R_3 are tall, with diphasic or inverted T₂ and T₃.
3. R wave is taller than normal in leads from the right side of the precordium (V_1 , V_2).
4. Intrinsic deflection is delayed in V_1 and V_2 .
5. Q may be present in leads from the right side of the precordium, while S is usually absent.
6. T wave is inverted in V_1 and V_2 (leads from the right side of the precordium).

cal right ventricular hypertrophy and Figure 7 illustrates representative cases. It can be seen that that standard limb leads may show right axis deviation, no axis deviation, or a prominent S in all three leads, depending upon the position of the heart.

Precordial leads have been of the greatest value in demonstrating anterior myocardial infarction when the standard limb leads were either normal or showed a nonspecific abnormality.^{15,18,22,29} Direct unipolar precordial leads in experimentally produced myocardial infarction in dogs have clarified the electrocardiographic picture of this im-

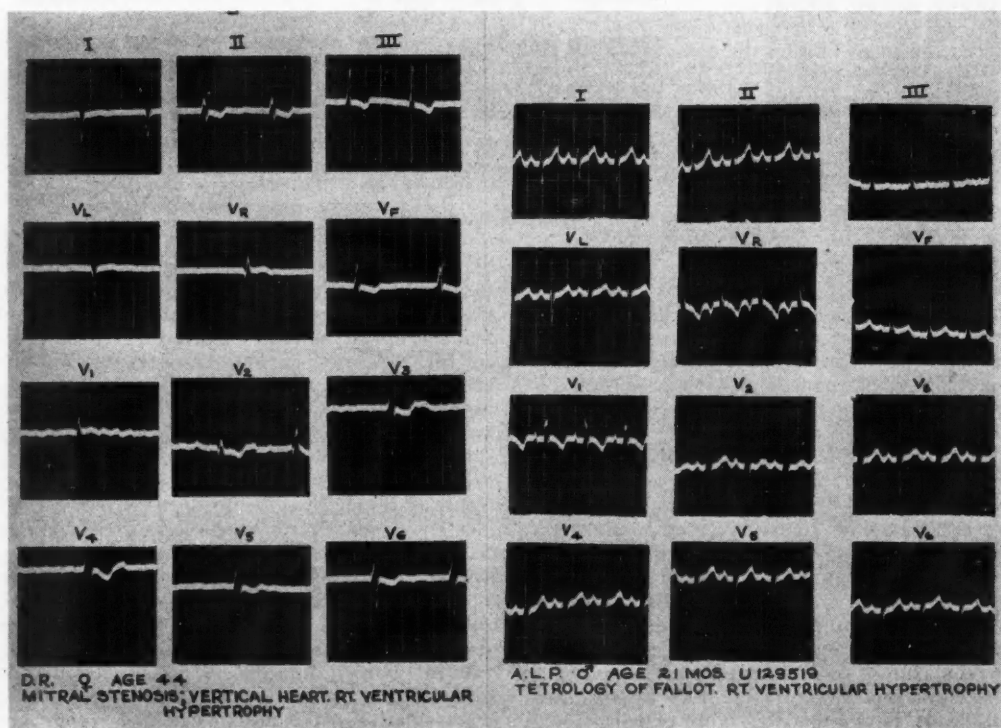


Fig. 7.—Right ventricular hypertrophy.

portant condition. Wilson and his group have found that one can determine not only the presence of myocardial infarction, but that its size, depth and location can be deduced from multiple uni-

TABLE 7.—*Myocardial Infarction*

1. QRS, RS-T segment, and T wave changes must be characteristic before making unequivocal diagnosis of myocardial infarction solely from the electrocardiogram.
2. Deep QS complexes in leads from the left side of the precordium indicate involvement of the entire thickness of the ventricular wall.
3. Deep QS complexes with notching indicate areas of cardiac muscle alive between electrode and adjacent ventricular cavity.
4. Deep Q wave followed by an R wave indicates that outer layers of the ventricular wall are relatively normal.
5. Q waves in leads from the right side of the precordium in right bundle branch block, and in leads from the left side of the precordium in left bundle branch block suggest associated myocardial infarction.
6. Anterior infarction associated solely with inverted T waves without QRS abnormalities in precordial leads are of lesser severity than those with QRS changes.
7. A T wave lower or a Q wave deeper in one precordial position than those in adjacent positions suggests localized myocardial damage.

polar precordial leads. This is of great importance in estimating the seriousness of the lesion. Changes in the electrocardiogram in coronary disease are dependent on actual myocardial abnormality, such as transient myocardial ischemia (as in attacks of spontaneous or induced angina pectoris), myocardial fibrosis and myocardial infarction. Precordial leads aid in evaluating the extent of the myocardial abnormality, not the coronary disease, per se.

Concept of central, marginal and ischemic zones. When an infarct is produced in the myocardium, it can be shown that not all areas of muscle are equally involved. If the infarct is large, it may have a central zone of complete necrosis with the entire thickness of the left ventricle involved. Surrounding the central zone is a marginal zone where only a portion of the ventricular wall is involved, usually subendocardial, infrequently subepicardial. Beyond the marginal zone will be found a larger ischemic zone where the involved muscle has impaired blood supply but is still alive and responsive. The size of these three zones is variable and the central zone may be absent if the infarct is small. Multiple precordial leads, by demonstrating the size of these various zones, are of value in allowing one to estimate the size of the infarct.

The most important of the changes in the electrocardiogram in cases of myocardial infarction concern the QRS complexes, because depth is involved (central or marginal zones), whereas infarction associated solely with ST-T changes is rarely extensive or significant (ischemic zone) (Wilson²⁵). When the infarction involves the entire thickness of the ventricular wall (central zone), the muscle is incapable of responding to the cardiac impulse, the infarcted area fails to undergo activation, and the potential variations of the ventricular cavity are transmitted to the epi-

cardial surface of the involved area. Since the ventricular cavity is electrically negative throughout the QRS interval, exploring electrodes placed over the epicardial surface of the central zone of an infarct will reflect this negative potential and the electrocardiogram will show a deep QS complex, without an R wave. The transmural infarcted muscle has been likened to an "electric window," a "physiologic hole" in the wall of the ventricle because the potential of the ventricular cavity and the epicardium is the same, as though no myocardium existed. Thus a deep QS complex in a precordial lead further to the left than V₂ usually means infarction with involvement of the entire thickness of the ventricular wall.

If the infarction in the central zone is not complete and islands of cardiac muscle in the area remain active, notching of the QS occurs, because of abortive areas of muscle responding to the wave of excitation. In the marginal zone, when the outer layers of the ventricular wall are fairly normal while the subendocardial muscle is infarcted, the negative potential of the ventricular cavity (Q wave) will be transmitted to the boundary between infarcted and normal muscle. In such a case the spread of the excitatory process through the normal myocardium will give a positive R wave and the electrocardiogram will show a deep Q wave followed by an R wave. Thus if the precordial electrocardiogram reveals a deep QS, one may conclude that the full thickness of the ventricular wall is involved in infarction; if a notched QS is recorded, one may assume that isolated areas of functioning muscle remain; if a deep Q followed by a small R is present, one may conclude that the infarct involves the subendocardial area of the ventricular wall, and that the outer subepicardial layer is relatively normal. In the QR complexes of subendocardial myocardial infarction, the Q wave has a duration greater than .03 second and its depth exceeds 25 per cent of the R wave in the same lead. These findings are of importance particularly if the adjacent lead to the right has an R wave. Thus in V₁ and V₂, a small R may occur in normal hearts or in those with left ventricular hypertrophy. If an R wave is present in V₁ or V₂ but disappears or becomes smaller in V₃ and V₄, and Q waves appear, the evidence for myocardial infarction is more conclusive than if the R waves are small in V₁, V₂ and V₃. Similarly, the R waves normally are smaller in V₅ and V₆ than in V₄, so that decreased voltage of R in these leads is not significant, unless the decrease is extreme. Deep Q waves in V₃ to V₆, when of the type described in central or marginal zones, are diagnostic, but they are of lesser value when tall R waves are present, and the Q wave is less than 30 per cent of the R wave. Q waves up to 3.0 mm. deep may appear in the left precordial leads in left ventricular hypertrophy but in this condition the voltage of R in these leads is high.

Having determined the depth of the myocardial infarction by the appearance of QS and deep, wide Q waves, multiple precordial leads may

allow one to estimate the extensiveness of involvement in a lateral direction. If characteristic QRS changes are present in only one or two leads (as V_2 and V_3 in anteroapical infarction or in V_6 in lateral infarction), the area of infarction can be considered to be fairly well localized. On the other hand, if the characteristic QRS changes are present in five or six of the precordial positions, the infarction must be extensive (Fig. 8). Thus we may conclude the depth and the extent of an infarction by the use of precordial leads.

One frequently sees characteristic ST-T wave changes extending beyond the precordial positions

muscle is of small extent. The abnormally inverted T waves in the ischemic zone have been attributed to abnormal repolarization.

ST changes are of value in the diagnosis of myocardial infarction when they have a characteristic contour and follow a convex or coved typical evolution, including the subsequent inversion of the T wave. When the artery that supplies the area of the heart upon which the exploring electrode rests is ligated, the ST segment is displaced upward. This ST change lasts from hours to days and then the ST segment returns toward the iso-electric line. Coinciding with the

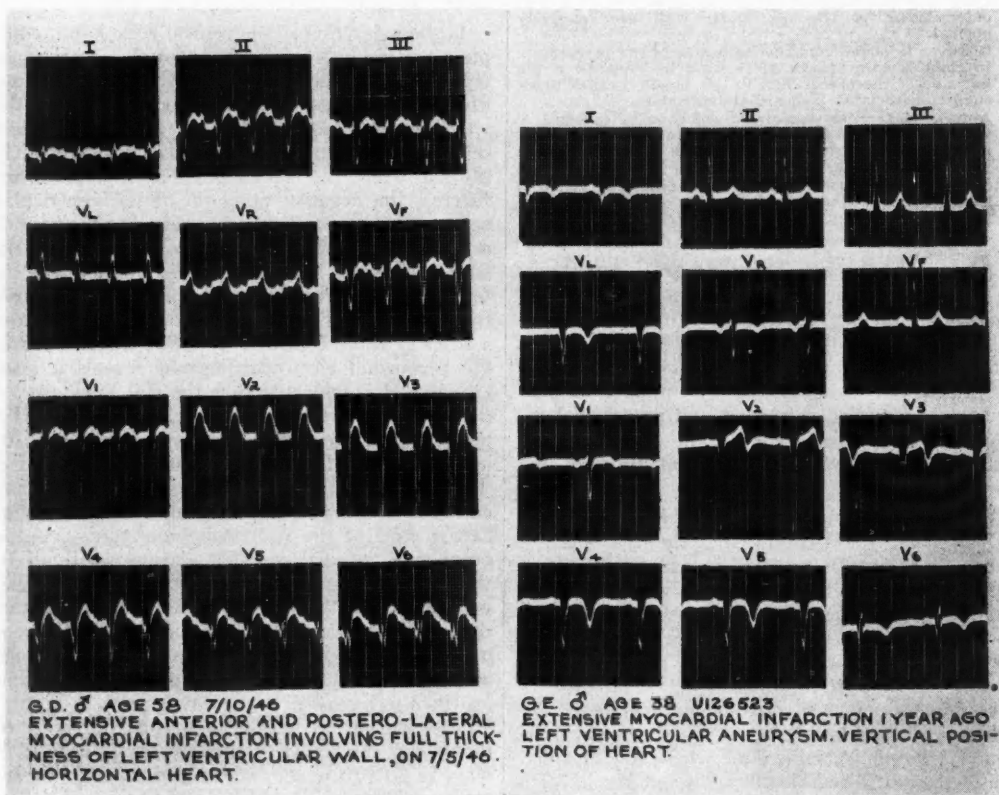


Fig. 8.—Extensive myocardial infarction.

in which typical QRS changes occur. This has also been noted in direct leads in experimentally produced myocardial infarction. In these animals, the T wave changes were often more conspicuous from the margins of the infarct rather than from the center, presumably being a reflection of the ischemic zone which extends beyond the marginal zone when an infarct is produced. Thus the extent of the T changes reflect the extent of the ischemic zone while the QRS changes reflect the extent of the infarcted areas. On the basis of these observations, Wilson has stated that myocardial infarction associated solely with T changes is rarely serious because only the electric potential of ischemic muscle is recorded, and "dead"

subsidence of the ST elevation, sharp, late inversion of the T wave appears. The T wave inversion lasts considerably longer and the wave may eventually return to normal, as does the ST interval. The ST-T changes are associated with injury and ischemia and are usually not permanent; although they may persist indefinitely at any stage of evolution; the QRS changes are almost always permanent and are associated with myocardial death. QRS changes, therefore, are more reliable than ST-T changes in determining the presence of old healed myocardial infarction, although ST-T changes, when characteristic in type and evolution are more typical of recent myocardial infarction. T wave changes may be due to many

causes, of which ventricular hypertrophy, conduction defects and digitalis are common ones. The diagnosis of recent myocardial infarction solely from the electrocardiogram must be considered conclusive only when characteristic QRS changes occur in association with transient ST segment abnormalities followed by typical T wave inversion. When a history compatible with myocardial infarction is obtained, the diagnosis may be made on lesser grounds.

The degree to which the standard limb leads will reflect the myocardial changes depends in part on the site of the infarction and in part on the position of the heart. Thus a small antero-septal infarction may not be reflected in the limb leads because the lateral surface of the left ventricle is not involved.

Localization of myocardial infarcts. (1) Antero-septal (Fig. 6). The maximal changes may be seen in V_2 , V_3 or V_4 , with characteristic QS or Q wave abnormalities depending on the degree of involvement of the thickness of the ventricular wall. Elevation of the ST interval followed by T wave inversion usually occurs in leads with QRS changes. Depressed ST and inverted T may occur in the ischemic zone which frequently involves V_5 and V_6 . The disappearance of R in V_2 or V_3 when it is present in the lead to the right is more important than a QS in V_1 , V_2 and V_3 . In the latter case, characteristic ST-T changes are necessary for diagnosis.

(2) Antero-apical. The maximal changes may be seen in V_4 or V_5 with the ischemic zone extending to V_3 and V_6 . The normal progressive increase in the amplitude of R as the electrode is moved across the chest is abruptly altered as the zone of infarction is entered; here a QS or QR complex is found, depending on the degree of involvement of the thickness of the ventricular wall.

(3) Anterolateral. The changes are similar to those of the antero-apical zone, except that the maximal changes are seen in V_6 or V_5 .

(4) Posterolateral. The limb leads are typical of posterior infarction (Q_2 , Q_3 , T_2 , T_3 pattern) but V_6 resembles anterolateral infarction with a significant Q wave and typical ST-T changes. There are no QRS changes in V_1 to V_5 but there may be depressed ST intervals in several of these leads depending on the extent of the infarction. The T waves are upright in V_1 to V_5 .

(5) Posterior (basal) infarction. The changes are similar to those of the posterolateral zone, except that V_6 has no QRS changes.

SUMMARY

1. Unipolar precordial leads are semi-direct leads that explore the anterior ventricular wall, and reflect primarily the electric activity of that portion of the myocardium immediately subjacent to the electrode.

2. Comparison of unipolar leads from the extremities and the precordium allows one to

visualize the electrocardiographic position of the heart. This knowledge aids in the interpretation of many atypical electrocardiographic patterns.

3. The characteristics of the unipolar precordial electrocardiogram in normal adults, in patients with bundle branch block, ventricular hypertrophy, and myocardial infarction, are summarized and illustrated.

4. Multiple precordial leads may reveal or clarify myocardial lesions not defined by standard limb leads or by a single apical precordial lead.

5. The minimum number of precordial leads advisable for routine use has not been determined. At present, positions one to six, inclusive, are advised when the routine four-lead electrocardiogram is not conclusive and a more complete study is required.

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75 PER CENT OF POLIO VICTIMS CAN RECOVER WITHOUT HANDICAP

"Infantile paralysis as a public health menace can be eliminated, scientists are convinced, but not until three basic 'musts' are completed," according to an article appearing in the current issue of *Hygeia*, health magazine of the American Medical Association.

The author—Roland H. Berg, staff member of the National Foundation for Infantile Paralysis—points to the following as the three polio problems:

"The first imposed task is to identify completely the tiny virus causing the disease. Scientists have yet to discover its physical appearance, chemical structure and growth requirements. Given this knowledge, researchers may be able to find the specific chemical, drug, serum, vaccine or antibiotic to halt the virus without injuring the body.

"The second laboratory trial is to unlock the mystery of the nerve cell that acts as a host and sustains the virus. The chemical changes that occur in the routine life processes of this highly important structure must be learned. Scientists must have these facts before they can alter the cell and make it resistant to virus attack without intrinsic injury to the cell itself.

"The third and final laboratory task is to develop a rapid and accurate method of diagnosis or identification of the virus. At present, an acute case of polio is not difficult to diagnose by an experienced physician. Severe clinical symptoms of muscle weakness, pain, stiffness of the neck and back can be recognized by a doctor with sufficient polio training. But recent scientific evidence has disclosed that for every patient with the frank, recognizable symptoms there may be a score or more children and adults with the mild, vague symptoms attributable to other diseases or with no symptoms at all. These persons are a hidden menace in the spread of the disease, for they also excrete the disease producing virus in their nose and throat discharges as well as from their bowels. Certain laboratory diagnosis, at present, can be made only after inoculating monkeys with some of the carefully prepared material collected from the excretions of suspected polio patients. The procedure is painstaking and requires great

skill. Weeks or months must pass before definite results are obtained. Doctors are badly in need of a rapid and accurate means of making a diagnosis. Unless all carriers of the virus can be identified quickly and easily, adequate control methods to halt the spread of poliomyelitis will not be possible."

The author points out that despite some 40 years of research efforts "it is still impossible to prevent the occurrence of an epidemic or even one single case of infantile paralysis.

"The agent that may carry the polio virus and transmit it to human beings has not yet been found," he states. "No tangible evidence has been uncovered to incriminate flies, mosquitoes or animal agents. On occasions scientists have discovered that flies trapped in epidemic areas carry the virus of polio, but they have not been able to link a polio-laden fly with an actual case of human polio. It may be possible for flies or other insects to be incriminated more definitely, but at the present time scientists believe that the disease is more likely passed by intimate person to person contact."

The author states that recently scientists at Stanford University under the direction of Dr. Hubert S. Loring have been about 80 per cent successful in purifying the virus. "They conclude that it is probably protein in character, ranging in size from eight to 20 millimicrons. This is one of the smallest organisms ever studied by man."

Great improvement in treatment has resulted from recent research efforts which demonstrate that virus damage to the spinal cord and brain areas is often only temporary. "Modern methods of care calling for immediate hospitalization and the early and continuous use of physical therapy strive to maintain muscles in as healthy a condition as possible," according to the author. "Because doctors now realize that virus damage to nerve cells need not be permanent, they seek to keep healthy those weakened muscles awaiting the day when normal nerve impulses will once more permit them to act normally. With this philosophy and method of treatment, physicians report that three out of every four cases of infantile paralysis can recover without any handicap."



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EDITORIALS

STREPTOMYCIN

The lack of availability heretofore of streptomycin has been a great disappointment to physicians whose patients seemed in urgent need of this new antibiotic; until less than a year ago the material could only be obtained by a few workers through highly specialized channels. Fortunately it was then possible to work out a mechanism whereby, under the supervision of the Committee on Therapeutics and Other Agents of the National Research Council, moderate amounts of streptomycin were distributed to a series of "responsible investigators" so that patients could be treated under controlled conditions and without cost in order to get a quick and reliable evaluation of what this antibiotic really accomplishes.

These investigators all reported the results of their studies to Dr. Chester Keefer, the Chairman of the Committee, and his report¹ of these pooled observations on 1000 patients represents a landmark in the study of streptomycin which every doctor should study with the greatest attention. Certain points seem definitely settled. First of all here is now a well-established list of the conditions in which streptomycin really is effective: Urinary tract infections due to various gram negative bacilli, bacteremias due to coliform bacilli and *B. Friedlander*, *H. influenzae* infections, tularemia, and meningitis due to coliform bacilli, *B. Friedlander*, *B. Pyocyaneus* and *H. influenzae*. On the other hand it now seems pretty clear that the material is of only questionable value in typhoid fever, Brucellosis and *Salmonella* infections. Malaria, Rickettsial infections and virus infections seem not affected at all. The position of tuberculosis is not yet settled but streptomycin has been shown to exercise undoubted beneficial effects in certain experimental tuberculous infections and suggestive palliative results have been obtained in some cases of tuberculosis in man. Large amounts of this expensive material over long periods of time are necessary and much

further study must be done; however, any ray of hope of effective therapy in tuberculosis is encouraging. More details as to indications can be found in the article by Dr. Keefer and his associates referred to above.

Quite recently streptomycin, with certain limitations, has been made available for all doctors—an event of the highest importance. The Civilian Production Administration has now undertaken—as it did with penicillin several years ago—to allocate a monthly allowance of streptomycin to civilian "depot" hospitals which in turn can distribute the material to doctors on proper request. Thirteen hospitals, for example, have been designated in San Francisco and the same number in Los Angeles, as well as hospitals in many other cities in California. When a doctor has a patient who needs streptomycin he will apply to the nearest depot hospital. The hospital in turn, since the supplies are as yet very limited, will probably request information showing that the case is a suitable one for streptomycin treatment. Streptomycin unfortunately is still quite expensive but it is to be hoped that prices will fall and supplies increase in the near future.

It is hard to avoid comparisons between streptomycin and penicillin and it must be admitted that penicillin still stands out on the whole as the more valuable agent. The conditions in which streptomycin is effective are unfortunately limited in number and some of the most brilliant results are had in diseases so rare—such as tularemia—as to constitute no great problem. Unpleasant and sometimes serious reactions—skin rashes, fever, constitutional symptoms and auditory nerve disturbances—frequently limit the time over which streptomycin can be given to a few days; there is also a tendency for many bacteria to become rapidly resistant to the drug. None the less, streptomycin has clearly come to stay and will be, if not a competitor, at least a valu-

able supplement to penicillin in a number of important infections not influenced by the latter. Doctors should use streptomycin carefully and critically in cases in which the results can be evaluated so that useful information will be ob-

tained and the patients' money will not be wasted.

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New Hospitals—New Methods

Under the recently enacted Hill-Burton Hospital Construction Bill a financial impetus will be given to the construction of new hospital and similar institutions throughout this State. Already 17 hospital districts have been formed and committees are meeting to discuss the most desirable location and size of proposed institutions in those areas. It is assumed that several of these institutions will house private or part-pay patients. Space or space and equipment will be furnished for surgical, radiological, pathological and other medical services. In institutions designed for the bed care of private patients it is to be hoped that plans will be made which will permit private practitioners of medicine to function in the most efficient and ethical manner possible.

In the past, it has been not unusual for hospitals to charge patients only a portion of the actual cost of their bed care. For example, many private hospitals have room or ward charges which cover about 80 per cent of the actual cost of the bed and basic hospital services. The remaining 20 per cent of costs is obtained from various sources, including a portion of the professional income of the radiologists, pathologists, anesthetists, and in some cases, obstetricians and surgeons. The diversion of professional fees toward the support of hospital beds has meant that those patients requiring

such professional services actually pay a larger proportion of the hospital charge than those not requiring them.

Sound economic policy suggests that an effort should be made to finance the beds in hospitals on a true cost basis. If it costs \$7.48 a day to operate a bed in a hospital, that should be the bed charge—and not \$5.50. Then there will not be undue pressure on the hospital administrator to seek additional income from the professional fees of staff and consultant physicians. This will encourage sounder relations on all sides, as well as providing departmental income for improved service.

It is perfectly simple and ethical for physicians such as radiologists and pathologists to rent space or space and equipment in the hospital and to furnish excellent medical care on a full professional basis. The details of such contractual arrangements have been published in journals devoted to hospital management as well as in journals pertaining to the specialties involved. The medical profession must feel that this first big expansion of medical care facilities may well set a precedent for future medical policies on a federal basis. It will welcome all sound developments in the hospital field, especially in those tending to perfect the relationship between hospitals and physicians.

FOLIC ACID

The brightest new star to flash across the horizon of medical therapeutics is that of folic acid. In the short space of six years the status of this substance has progressed from an unidentified deficiency to isolation, synthesis and successful application in the therapy of the macrocytic anemia of pernicious anemia, sprue, nutritional anemia, pernicious anemia of pregnancy and megaloblastic anemia of infancy. This phenomenal progress has been made possible by the combined efforts of a number of different groups of investigators, sometimes working in fields which appeared unrelated.

A group of substances widely distributed in natural products, including liver, yeast and spinach, were observed to supply deficiencies in growth or hematopoiesis in animals. They were referred to as Vitamin M, folic acid, lactobacillus

casei factor and streptococcus fecalis R factor, depending on the source of the material and the species of organism used for test purposes (chicks, monkeys, rats, fish and *L. casei*). The various forms of this dietary factor differed in their activity toward different test objects in their ability to substitute for the deficiency. Folic acid was considered to be a factor in liver which possessed hematopoietic activity and was essential for the growth of *L. casei*. A closely related compound was found in fermentation products. During the past year two cooperating groups of workers^{1,2} have announced the isolation and the synthesis of the liver *L. casei* factor. The structural formula established for this substance is N - [4 - {[(2 - amino - 4 hydroxy - 6 - pteridyl) methyl] amino } benzoyl] glutamic acid. As an abbreviated designation the name pteroylglutamic acid was proposed. The same authors likewise

synthesized closely related compounds which appeared identical with the L. casei factor from fermentation products and with the streptococcus faecalis R factor.

Several publications have appeared dealing with the clinical applications of synthetic folic acid (liver L. casei factor). It is an effective agent in the treatment of macrocytic anemias,^{3,4,5,7} including Addisonian anemia, nutritional macrocytic anemia, pernicious anemia of pregnancy, sprue, and megaloblastic anemia of infancy. The hemopoietic response is characterized by an increase in reticulocytes, erythrocytes, leukocytes, platelets, normoblasts and hemoglobin and by a decrease in the megoloblasts in the bone marrow.

In sprue³ the results have been dramatic. Within three days after the institution of therapy there is an improved sense of well being, soon followed by relief of the glossitis, cessation of the diarrhea, increase in appetite and weight and return to a normal type of sugar tolerance curve. The similarity of response in "tropical" and "non-tropical" sprue furnishes incidental evidence of the essential identity of these two conditions. It seems likely that both represent the syndrome of folic acid deficiency.

Aplastic anemias, iron deficiency anemia, the anemia associated with leukemia and the leukopenia following sulfonamides and radiation therapy of malignant disease⁶ have been refractory to folic acid.

The dosage has been experimental to date and has varied from 15 to 200 mg. per day. The average optimum dose will probably be found somewhere around the lower end of this scale. Administration is either oral or parenteral.

The existence of a compound in liver, other than that of the still not isolated liver antianemia principle contained in Cohn's fraction G, yet possessing hemopoietic activity in macrocytic anemia, arouses much speculation with regard to the relationship of these substances. The poor results in the treatment of combined system disease obtained with synthetic folic acid suggest that liver extract will continue to be preferable in the therapy of Addisonian anemia unless the patient is sensitive to it. Likewise the excellent response obtained with folic acid in sprue and nutritional anemia make it the treatment of choice.

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U. C. MAN OFFERS NEW NERVE DISEASE THEORY

A new theory to explain a nerve condition in which there is derangement of movements of the eyeballs, lids and facial muscles has been offered by Dr. Robert Wartenberg, associate professor of neurology in the University of California Medical School.

The loss of coordination of muscles usually follows injury, surgery, or disease, to the nerve controlling movement of the eyeballs or of the facial muscles.

In this condition the victim finds when looking straight ahead that one eyelid refuses to open; but it opens when he looks to the side; or if he closes his eye he cannot help screwing up his face in an odd manner.

Eminent neurologists long since have agreed generally

that the condition is caused by nerve fibers going astray as they grow forward after injury, arriving at muscles to which they do not belong and thereby upsetting normal muscle coordination.

Dr. Wartenberg presents a host of arguments refuting this theory, and suggests that the derangement is caused by a sort of "chain reaction" in which the root of the nerve in the brain stem is affected.

The neurologist suggests that damage to the nerves at some point between the brain and the eyes or face causes the nerve to be affected not only at that point but also at its base in the brain. This sets off a release mechanism which results in the loss of control by the nerve of movement of the eyes and lids and of other facial muscles.



Clinical-Pathological Conference*

Case history: A man aged 29 years enjoyed good health until three months previously, at which time he had a severe sore throat lasting two weeks. He denied having had rheumatic fever, scarlet fever or nephritis. About one week after recovery from the sore throat, he complained of abdominal cramps with nausea, slight fever and weakness. He had lost eight pounds in weight. The blood pressure was 125/82 gradually increasing to 200/110. The temperature varied in the next few days; it was low in the morning and reached a peak between 4 P.M. and 8 P.M.; the highest recorded temperature was 40.5°C. A questionable mass was palpable in the right upper abdomen. Urinalyses were constantly positive for albumin, leucocytes and erythrocytes; occasionally gross blood and granular casts were present.

Physical examination: On admission to the hospital, the temperature was 36.5, pulse 118, respiration 22, blood pressure 184/34. The skin was pale and doughy. There were ecchymoses over both ankles, and edema of the optic discs and obscuration of the retinal vessels. The vessels were small and spastic. There were early cotton-wool exudates in each eye between arterial forks, and occasional striate hemorrhages in retinas.

Laboratory Examinations: X-Ray of chest revealed heart and lungs to be within normal limits. Electrocardiograms revealed occasional premature ventricular systoles and left axis deviation and changes suggestive of myocardial involvement. A series of urinalyses consistently revealed albumin, many RBC and WBC and occasional granular casts and a specific gravity varying from 1.005 to 1.026. Blood chemistry on admission: NPN-92 mg., Creatinine 2.9 mg. Subsequent studies showed a gradual decrease and the final reports were NPN-28 mg., Creatinine 1 mg. The blood counts revealed a progressive anemia and leucocytosis. The highest leucocyte count recorded was 37,800 with 81% neutrophils and 19% lymphocytes. The last blood count (two days before death) showed 17,900 leucocytes with 85% neutrophils and 15% lymphocytes. Blood protein was consistently below normal with constant albumin-globulin reversal.

Course: The patient was fairly comfortable with relatively no complaints except failing vision. His blood pressure varied considerably, on several occasions the blood pressure was within normal range, but as a rule, it remained near 184/134. The day before death it was 190/120. There developed a systolic murmur over the mitral area which would disappear at times. A gallop rhythm was also noted and there was evidence of enlargement of the left ventricle, but

at no time did he reveal acute evidences of cardiac insufficiency.

Three days before death he complained of a sudden appearance of severe pain in the right flank and on examination slight resistance to palpation and a slight mass were palpable in this area. He was given an injection of Depropanex with slight relief of pain. The following day pain was complained of in the left flank. Tenderness was elicited in this area but no mass was palpable. The pain in the right kidney area was attributed to the passage of blood clots since gross blood was noted in the urine. Two days later the patient suddenly expired.

Clinician's discussion: The diagnosis in this patient must explain a fulminating renal lesion with marked albuminuria, hematuria, casts, and a suddenly developed hypertension. This was followed by rapid rise of NPN and Creatinine in the blood, and by progressive changes in the eye grounds with edema and exudate. Apparently a rapid throttling down of circulation through the glomerulus was occurring. The heart enlarged and a systolic murmur developed at the mitral area. The EGG patterns were interpreted as showing "myocardial involvement" but no description of the graphic pattern is given aside from the presence of ventricular premature beats and the presence of left axis deviation. One would like to know the character and serial behavior of the T waves. Fever, leucocytosis, and pain in the right flank developed, followed by gross hematuria, at which time a tender mass was felt in the right upper abdominal quadrant. Death occurred suddenly, less than three months after the onset of his symptoms.

The explanations of the degenerative or inflammatory lesion in the kidney capable of producing such fulminating and quickly fatal results offer problems. The clinical picture certainly does not fit the ordinary natural history of acute diffuse glomerulo-nephritis in which death is an exceptional outcome.

The rapid development of hypertension, azotemia, and retinal changes are evidence of a process both fulminating and diffuse.

Fishberg describes this type of nephritis as due to inflammatory and necrotizing lesions of the vas afferens of the glomerulus. All of his patients with this type of lesions died from renal insufficiency.

More recently reports have appeared in which marked cardiac signs and symptoms have been pointed out as occurring with acute diffuse glomerulo-nephritis. In several of these, postmortem examination has shown acute arteriolitis diffusely scattered in the bodily tissues. They seem to con-

* From St. Vincent's Hospital, Los Angeles.

form in many ways to what we regard as periarteritis nodosa, or polyarteritis nodosa with fulminating renal and cardiac symptoms.

Whether ordinary acute glomerulo-nephritis is a distinct entity, and this other type of disease due to necrotizing arteriolitis is another, or whether they represent different degrees of response to a common etiologic agent, we do not know. It is interesting, however, that many workers are regarding the pathogenesis of ordinary acute diffuse glomerulo-nephritis as due to an allergic mechanism, and this is perhaps the view of the majority of observers in regard to the pathogenesis of polyarteritis.

A good guess, therefore, is that the diffuse nephritis in these cases is due to necrotizing arteriolitis and that there is probably a diffuse arteritis throughout the body. Polyarteritis probably always should be thought of in a young male with fever, leucocytosis, anorexia, hypertension, and a number of apparently unrelated data. This disease has protean manifestations and should be suspected in any acute sepsis with bizarre symptoms not explainable by a single diagnosis.

Fever, leucocytosis, albuminuria, abdominal pain, hypertension and hematuria are found in about half of the cases which have been reported. Pain in the flanks accompanying hematuria usually indicates renal infarction of perirenal hemorrhage. Renal insufficiency with uremia often terminates life.

This is a difficult diagnosis to prove, save by necropsy. Superficial periarterial nodules from which the original name periarteritis nodosa was derived are not common, and are found in less than one-fourth of the cases. They were not mentioned in the case under consideration. A tentative diagnosis based upon clinical data, however, cannot be refuted by negative biopsy findings. The value of the biopsy rests in the few instances where the suspected diagnosis is confirmed. Even with confirmation, the treatment is non-specific as the etiology is obscure. Regarded as a sensitization response to drugs, serums or infection, the condition is little influenced by treatment. Apparent cures have occurred with such diverse agents that their relationship to cure is not too impressive.

Autopsy findings: The principle lesions found grossly involved the kidneys, heart and intestinal tract.

The right kidney formed a part of a large globular mass occupying the right loin. The bulk of the mass was a large hematoma, the peripheral third of which was clotted, the central two-thirds composed of fluid blood. The hematoma resulted from the rupture of an aneurysmal sac which occupied the kidney parenchyma just above the center on the anterior surface. In the kidney the hematoma was walled off by a thick whitish membrane and the clot was laminated except at the center where it was semi-fluid. The lesion was a pseudo aneurysm of a small intrarenal artery, the main renal vessels as traced from aorta to hilus

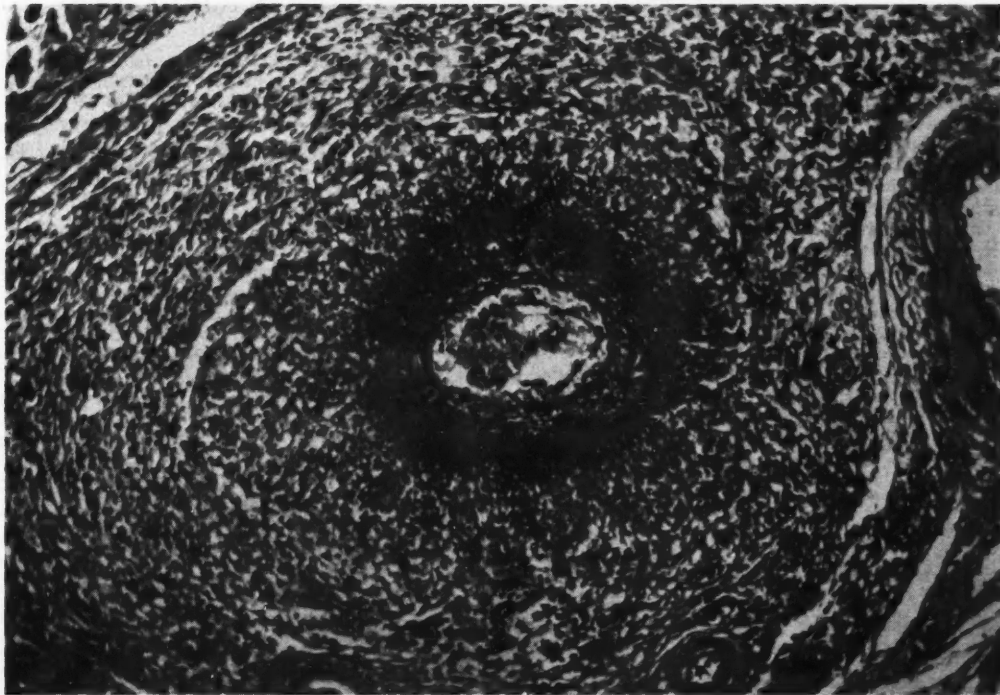


Figure 1.

were normal. In addition several smaller aneurysms were seen in the kidney parenchyma as well as several small infarcts. The left kidney also contained small aneurysms and infarcts.

The heart was enlarged with moderate hypertrophy of the left ventricle. There was an irregular white scar in the posterior part of the septum. The coronary vessels appeared normal.

In the stomach there were numerous small red erosions. In the jejunum there were visible and palpable ten reddish masses within folds of mucosa. In the cecum, ascending colon and transverse colon there were innumerable reddish irregular erosions beneath which the submucosa was slightly thickened and indurated.

Microscopic examination revealed polyarteritis nodosa as the basis of the gross lesions. The renal aneurysms were pseudo-aneurysms resulting from rupture of weakened vessel walls with hemorrhage into the parenchyma. The distribution of the involved vessels was very erratic as noted in the gastro-intestinal tract. Most organs contained at least a few involved vessels even though their presence was not suspected grossly; however, there were no typical lesions in the skeletal muscles or skin. The accompanying photomicrograph (Figure 1) is of a vessel from the perirenal fat. In this vessel the lumen contains fibrin and red cells. Many of the intimal cells are detached. The inner portion of the muscularis is necrotic. The remainder of the muscle is lost in an infiltrating mass of polymorphonuclears, lymphocytes,

phagocytes and fibroblasts which extend into the adventitia and out into the surrounding tissue.

Pathologist's discussion: It is not so surprising that polyarteritis nodosa with massive involvement of the kidney masqueraded as an acute glomerular nephritis but it is remarkable that a patient with almost universal vascular lesions exhibited no other manifestations of the disease. In retrospect, no single point stands out to suggest the true character of the disease although the progressive eyeground changes and stationary hypertension in the face of decreasing azotemia and unfixed specific gravity of urine, might have suggested that this was an unusual case of glomerular nephritis. Even had muscle biopsy been resorted to, the chances were against a typical lesion being found.

The case gives no assistance in determining the etiology of this disease although two possible etiologic agents were mentioned in the history: (a) sore throat, and (b) sulfa therapy. The proponents of sensitivity to streptococci as the basis of this vascular syndrome would point to the acute upper respiratory infection as the sensitizing factor. Those who believe that the lesion is a manifestation of sensitivity to sulfa drugs would point to the fact that large amounts of these drugs were given on both admissions. The reason for the sudden death of this patient was not found, a circumstance frequently noted before in the disease and usually attributed to sudden spasm of the vessels of the brain and heart.

X-RAY SHOW UNBORN CHILD OF 12 WEEKS BREATHE, SWALLOWS

Two Chicago doctors have demonstrated by means of a dye and x-rays that the important functions of breathing and swallowing develop as early as the 12th week in an unborn child.

Writing in the August 10 issue of *The Journal of the American Medical Association*, the authors—M. Edward Davis and Edith L. Potter from the Department of Obstetrics and Gynecology, the University of Chicago School of Medicine and the Chicago Lying-in Hospital—state that these experiments were carried out on two groups of patients: one made up of 16 women, who, because of some serious maternal complication, had to have their pregnancy terminated in the first half of the period and the second consisted of 10 women who were delivered by a cesarean operation.

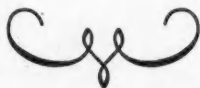
The dye, opaque to x-rays, was injected into the sac containing the fetus. From 17 to 52 hours later the pregnancy was terminated and the fetus was sent to the x-ray laboratory. The first group of fetuses showed the dye in all parts of the lungs, in the stomach and throughout the

intestinal tract, demonstrating that the fetus aspirated the fluid within the sac and exhaled it. Thus there is evidence that the fluid normally moves in and out of the lungs.

The second series of patients, who were delivered by cesarean operation, were treated in the same manner. X-ray examination of the infants' lungs immediately after delivery showed evidence of the dye in five, probable presence in two and no definite evidence in three.

The authors point out that the "general pattern of respiratory activity is developed very early in fetal life." During this period the respiratory movements are intermittent, irregular and shallow. "At birth air is substituted for fluid, and respirations become deeper, regular and continuous, but the pattern remains the same. The major change involves the substitution of air for fluid as a medium of exchange."

In conclusion, Drs. Davis and Potter state that "fetal swallowing and complete gastrointestinal activity has been demonstrated for the first time in a human fetus [12 weeks old] weighing 39 grams."



CLINICAL CONFERENCE

The Treatment of Subacute Bacterial Endocarditis

UNIVERSITY OF CALIFORNIA HOSPITAL STAFF CONFERENCE, OCTOBER 2, 1946

CASE presentation, *Dr. Herbert Moffitt, Jr.:

A 65-year-old white machinist was admitted on June 20, 1946. Since May, 1945, patient had had intermittent episodes of chills, fever, sweating, malaise, and anoxia associated with anemia and thirty pound weight loss. He has been hospitalized elsewhere on eight occasions and treated with penicillin and transfusions with resultant relief of symptoms for two or three weeks. In March, 1946, blood culture was reported positive for streptococcus viridans for the first time. In April, 1946, he had an episode of acute pulmonary edema. There had been no evident embolic phenomena. There was no history of rheumatic fever although a murmur had been noted twelve years before entry when he was granted an insurance policy.

Examination at entry on June 20, 1946, revealed the following positive findings: (1) Erythematous macular rash over trunk and arms; (2) Petechial hemorrhages on right hand (three) and left foot (two). (3) Loud, harsh, widely-transmitted apical systolic murmur without thrill or cardiac enlargement. (4) Splenomegaly two finger-breadths below costal margin. (5) A rectal polyp 10 cm. above the sphincter.

Significant laboratory findings at time of admission included: Hgb.: 92 per cent, RBC: 4.04 million, WBC: 7,600 with normal differential, CSR: 36 mm./hr. Urino gravity 1.023; albumin 3 plus; 5 WBC and 5 RBC per HPF; hyaline and granular casts. Chest x-ray and EKG were consistent with left auricular enlargement. Circulation time, venous pressure, and vital capacity were normal. Biopsy showed the rectal polyp to be a malignant pailloma; it was excised and the base was cauterized.

During the first week of hospitalization, fever spiked to 40.7 with chills; five blood cultures were positive for streptococcus viridans; the organism was sensitive to 0.01 units penicillin per cc. During the second week the patient was given 400,000-500,000 units of penicillin daily by continuous intramuscular drip with a resultant blood level of 0.31 units/cc. Dosage was increased to 1,500,000 units daily during the last week of July and continued in this dosage in spite of low grade fever and occasional spikes to 38.6 until August 26, when continuous penicillin was discontinued, after a total dosage of 68,300,000 units. On September 3, 30cc. of pus was evacuated from an abscess at the site of previous catheterization in the right lateral thigh but this pus was not cultured. During

hospitalization, patient was given three transfusions; he had an episode of acute pulmonary edema following the last transfusion but this cleared in six hours of treatment with oxygen, morphine, and aminophyllin. He had been previously digitalized.

The patient was discharged on September 12, after being afebrile and symptom free 19 days after the cessation of specific therapy. At time of discharge, all blood cultures had been negative for two months, Hgb was 80 per cent, RBC 4.08 million, WBC 7,800, CSR 27 mm./hr. Urine showed 1 plus albumin, few WBC, rare granular cast.

*Dr. Kerr: I am asking Dr. Rantz to open the discussion and will ask him and the other discussants to bring out the following points:

1. What is the best method of administration of penicillin?
2. What is the validity of the penicillin blood level and the sensitivity of the organism as indices of penicillin dosage? How much can we rely on sensitivity and blood levels so as not to waste the drug?
3. What is the proper dosage and how often, how much and how long?
4. What are the criteria for cure?

**Dr. Rantz: The manner of administration and the duration of therapy in the group treated here and that at Stanford Hospitals is really quite different. I cannot attempt to answer all of Dr. Kerr's questions this morning. There are many variables in the treatment of this disease. The total duration of the therapy was kept constant in our patients who received therapy for 60 days. If the patient needed more treatment, another course of 60 days was given. We also control the factor of route of administration by using three hour intermittent intramuscular therapy which may, on the whole, be more satisfactory than continuous therapy. There is no way to settle this. With intermittent therapy we have treated patients with smaller daily doses than the California group has been required to use.

We have studied 32 patients at Stanford, 20 of whom received 300,000 units per day for 60 days. In all the strain of streptococcus was inhibited by .05 units per cc. of penicillin; all were bacteriologically cured. In the beginning when patients were first admitted to the clinic it was impossible to increase the daily dose of penicillin. As more

* Assistant Resident in Medicine, University of California Hospital.

* Dr. William Kerr, Professor of Medicine, University of California Medical School.

** Dr. Lowell Rantz, Assistant Professor of Medicine, Stanford University Medical School.

of the drug became available, we began to use more and more in certain cases. We have several patients who have had more than one course of penicillin. We have estimated the daily dose as 1,000,000 units for each tenth of a unit of sensitivity to the organism. Nine cases have recovered in which more than 1,000,000 units per day were given. One case was of some interest and raises another point of great importance which was not appreciated previously. This is the matter of renal function.

Many blood level determinations have not been done but we have been interested in excretion of penicillin studies carried out in this patient, which demonstrated that he cleared only 125 cc. of blood per minute of penicillin instead of the normal 600 or 700 cc. His blood levels were, therefore, several times higher than would be expected in a normal person. A cure was obtained with a dose of 12,000,000 units per day although his organism required 5.0 units per cc. of penicillin for complete inhibition *in vitro*.

It is possible to predict dosage on the basis of sensitivity with some accuracy, but there is a tendency to use larger amounts of penicillin even though we know that cure may be usually obtained with smaller dosage. We feel that the most reliable sign is a sterile blood culture. No other clinical or laboratory criteria for cure are very helpful. To determine if the disease is arrested, it is necessary to carry out an adequate course of therapy, withdraw the drug, and follow the patient clinically and with blood cultures.

†Dr. Brown: Subacute bacterial endocarditis is a complicated disease. We cannot approach it as a simple infection for which we can plan routine methods of treatment. Heart damage is always present and is even more extensive after treatment when the infecting organisms have been eliminated and the valves have healed. Many patients will develop congestive failure from which they will succumb. In spite of present methods of therapy the disease remains extremely serious and we should approach the problem with humility. Up to about a year ago recovery rates were estimated at little better than 40 per cent. Now more patients are being cured of the infection. Theoretically all patients with subacute bacterial endocarditis due to penicillin sensitive organisms should be cured of the infection. Heart damage then remains. However, many recovered patients live useful lives and the ultimate prognosis of any patient is difficult to predict so that all should be regarded with optimism.

Since treatment is antibacterial in nature, the infecting organism and its sensitivity to penicillin is of first importance and must be determined at the outset. The alpha hemolytic streptococcus (*streptococcus viridans*) is the cause in the vast majority of patients. Fortunately most strains are

relatively sensitive to penicillin. Strains of *streptococcus faecalis* are perhaps next most frequent. These are in general less sensitive and must be differentiated from *strept. viridans*. Almost all pathogenic organisms are capable of causing subacute bacterial endocarditis in rare instances. It is obviously of the greatest importance for treatment and an evaluation of prognosis to promptly determine the nature and characteristics of the infecting organism in any case.

A consideration of the best method of administration of penicillin raises differences of opinion. We have preferred the continuous intramuscular injection method for several reasons. It seemed easier on the patient to have a soft catheter continuously in the muscle with an infusion bottle attached than to receive repeated injections over many weeks. Most patients agree. It also seemed more convenient for the ward staff. Finally it has been our opinion that the maintenance of a continuous effective blood level was more rational than to obtain intermittent peaks; this last is controversial as mentioned before. Other methods of administration such as the oral, intravenous, etc., have drawbacks which make them less desirable than the intramuscular route.

The criteria for cure of subacute bacterial endocarditis are difficult to determine. Obviously if the blood culture remains positive the infection is still active. However, if the blood culture is negative, infection on the heart valve may still be present and become active when penicillin is stopped. Fever, embolic phenomena and elevated sedimentation rate may continue for a short time even though recovery has taken place and are therefore not reliable as guides to continuing infection. We hope to develop tests which will indicate when infection has been eliminated. Since patients with subacute bacterial endocarditis have significant amounts of antibody in their blood against the infecting organism and normal people do not, measurement of this level might be a guide. Supposedly, after cure these antibodies will disappear. We have employed precipitin tests to measure antibodies against the alpha hemolytic streptococcus. To date all patients have had antibodies but they have remained during treatment. These immune bodies will probably not disappear for several weeks and so such measurements can constitute only a late guide to cure.

*Dr. Friedlander: Two of four patients recently seen developed subacute bacterial endocarditis following dental extractions. We should be able to give penicillin in adequate prophylactic dosage to patients who have heart disease and who must undergo oral surgery.

Dr. Kerr: This prophylactic measure might be used in other types of surgery, also. Some patients have been treated for long periods of time. Observations have been made which indicate that

† Dr. John W. Brown, Assistant Professor of Medicine, University of California Medical School.

* Dr. Richard D. Friedlander, Assistant Clinical Professor of Medicine, University of California Medical School.

when one uses an antibiotic like penicillin which eliminates certain organisms, other organisms may grow. It has been suggested that large doses

of penicillin given by mouth may cause the development of such a condition as the brown tongue associated with monilia.

PENICILLIN SPRAY ECONOMIC WAY TO TREAT RESPIRATORY DISEASES

Inhaling penicillin spray is more economical and effective for infections of the respiratory tract than injecting of the respiratory tract than injecting the drug into the veins or muscles, according to the latest report appearing in the October 5 issue of *The Journal of the American Medical Association*.

Frank W. Morse, M.D., of Lawrencetown, Nova Scotia, says that by this treatment penicillin is placed at the site of infection and has not only a strong local effect but it is absorbed into the blood stream and aids the natural body defenses to overcome the condition. Moreover, "it also has a definite local soothing effect which relieves such discomfort as soreness in the throat, painful, frequent coughing and the sensation of dryness in the mucous membranes."

The author maintains that the "penicillin seems to act in a more efficient manner when given by spray than by injection. It is common to give 160,000 units daily by the intramuscular route in pneumonia, whereas in treatment of one case of pneumonia in this series 40,000 units was given daily for four days, a total dosage of 160,000 units in all. In other words, the total dose in this case treated by spray would supply only one day's dose if given intramuscularly. This saving of penicillin is apparently due to the fact, that, first, the greatest concentration of penicillin is directly on the infected site, the air sacs, and secondly, it is absorbed into the blood stream and thus has a systemic effect as well."

Most of the 25 patients who were treated by this physician were infected during the influenza epidemic which began in this locality about January 3, 1946. There were only two failures in this series, due to the uncooperativeness of the patients.

Penicillin spray is produced by a hand-operated bulb atomizer. The patient inhales and then holds his breath allowing the suspended penicillin to settle on the infected mucous membranes.

Personally convinced of the advantages of penicillin spray, the author summarizes them as follows:

1. The absence of toxicity in contrast to that of the sulfonamides.
2. The absence of dangers due to untrained personnel using the intramuscular route of administration.
3. The ease of transporting and caring for the materials, the atomizer and penicillin.
4. The availability of materials. Atomizers can be easily obtained and are cheap. Penicillin spray can be purchased at a small cost.
5. Painless administration. This is an important factor in nervous or young patients.
6. The saving of penicillin.
7. The remarkably soothing local effect of penicillin spray in addition to its therapeutic effectiveness.
8. The pleasant taste of penicillin.
9. The absorption of inhaled penicillin. The fact that inhaled penicillin spray is absorbed and can attain an effective level in the blood suggests that perhaps sites of infection other than those in the respiratory tract may be treated in this manner.

An editorial in the same issue of *The Journal* states that penicillin spray is probably the simplest technique thus far employed for the treatment of respiratory conditions. "The results recorded are encouraging," it says, adding: "However, much more needs to be done on the subject of penicillin administration by inhalation before this procedure can be considered of established scientific merit. Controlled studies are necessary. Large enough numbers of patients with a single respiratory disease need to be studied and compared with similar groups treated without penicillin and with penicillin administered by the usual intramuscular route. Comparative studies should be made on the value and accuracy of the various types of nebulizers and on their effectiveness in delivering the penicillin where it will do the most good. Important also are careful studies on the optimum dosage of penicillin when given by spray, the preferred frequency of administration and the most desirable medium for dissolving the penicillin."



CALIFORNIA MEDICAL ASSOCIATION

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FOR COMPLETE ROSTER OF OFFICERS, SEE ADVERTISING PAGE 4

NOTICES AND REPORTS

California Physicians' Service—Record-Keeping

California Physicians' Service had an enrollment of 272,440 beneficiary members as of September 1 this year an increase of more than 115,000 during the past 12 months. Enrollment figures for September are not yet available as this is written, but at the present rate membership will exceed 300,000 within two months and should be approaching the half million mark within the next six to eight months.

Interest shown by the general public in the C.P.S. prepaid medical care program is gratifying to the board of trustees and the administration. It is felt that the quickened interest is the result of several factors, salient among them being the splendid public relations program being carried by the California Medical Association. Most important of all is that the medical profession of California is demonstrating to the public that it is sincerely and efficiently providing a prepaid medical service plan to people in the lower income brackets.

The rapid increase in C.P.S. membership has presented many problems to the administration, which has been handicapped by lack of trained personnel and office space. These handicaps are being overcome as rapidly as possible. Experience shows that rapid enrollment always is followed by a high percentage of utilization of the surgical contract for the first few months. This necessitates constant and careful study by the medical department to keep C.P.S. policies on a sound actuarial basis. In this important department C.P.S. has 66 employees in Los Angeles and 51 in San Francisco handling the commercial and veterans' programs.

Probably only a few physicians realize the important role the medical department plays in keeping C.P.S. on an even keel.

Each day thousands of punch cards speed through the IBM machines. From the carded cryptics comes a report on the activity of thousands of physicians . . . a report on the thousands of beneficiary members of C.P.S. . . . a report on the cost of, say, Case No. 549.

Did you know that some 10,500 beneficiary members each month are under the care of physicians scattered throughout the State of California? That out of every 1,000 members 30 to 35 will seek treatment in physicians' offices each month? That there will be approximately two and one-half bills per patient?

Our machine records tell us this. And more. That over 25,000 bills per month must be individually priced and coded.

C.P.S. has long since learned that there is a general pattern of the practice of medicine in this state which is almost mathematically predictable. For this reason, it has abandoned the time-worn procedure that characterizes

other medical service plans, where an initial report must be submitted and authorization be granted to perform certain procedures for certain types of illnesses.

Under the C.P.S. procedure, the patient's identification card is an immediate authorization for treatment. It is only necessary for the physician to submit to C.P.S. at the end of each month his bill for the services rendered.

When this bill is received in the C.P.S. offices it is checked with what is known as the "Positive Identification Section." This section has listed all the members and their status. The lists show whether or not their dues have been paid and the type of contracts that they hold. After the eligibility has been determined, a case that has never had service under C.P.S. becomes a patient, and a medical folder is made up in which the present treatment and all future treatments will be filed together. If the patient has been under care previously, his medical record is pulled from the file and the case is studied in relation to the medical care that has been rendered.

The bills are then sent to the Medical Department, where they are priced according to the C.P.S. Fee Schedule. At this point the cases are carefully studied to determine benefits—whether or not the chronic condition clause has run out, whether or not the patient has had one year's care for a particular illness, and many other factors that relate to the contract provisions. After this has been determined, each individual case ends up in a series of code numbers. Before each price there is an abbreviated diagnostic code of some 1,000 items. This code was taken from the United States Public Health Morbidity Code, and was specifically designed for use in prepaid medical care plans. It has only been developed since 1940. Thus each illness that is being seen ends up with a code number. For instance, appendicitis becomes No. 549. If it happens to be a perforation of the appendix, it becomes No. 540.

For each case of illness a case number is assigned, so that all costs relative to the particular case may be gathered together and eventually C.P.S. may determine the cost per case. The cost per case may involve the surgeon's services, an assistant and anesthetist, certain laboratory work; and for hospitalization will include so many days in the hospital, plus operating room costs.

After these facts are determined, one further step is developed, to determine just what has been done to care for any particular illness. Thus, if an appendectomy had been performed for appendicitis, the code number 222 would be assigned, and for the assistant's services there would be the code number 194. Any other services that were performed would be assigned the proper procedure number.

From this it can be seen that C.P.S. is in a position to know exactly how many cases of illness are treated in a month, the type of illnesses, what was done for any particular illness, and the cost per case. All this information is transferred as a permanent record onto the International Business Machine punch cards. At the end of each month a standard report of the number of kinds of illnesses treated and their costs is presented to the executives of C.P.S. for study. For example, in the month of March of 1946, the record shows that 7,723 cases of illness were reported. It also shows that of this number, 209 were cases of appendicitis, 123 hernias repaired, 90 live births and 608 tonsillectomies. There was \$235,710.44 expended in this month for services, distributed according to the following table:

TOTAL DUES.....		\$276,592.40
MEDICAL COSTS.....	\$ 56,229.97	
Attending Physicians..	\$ 33,719.20	
Assistants and		
Consultants	468.68	
Anesthetists	10.32	
X-ray and Radium...	12,608.49	
Laboratory and Misc..	9,423.28	
SURGICAL COSTS.....	149,204.08	
Attending Physicians..	111,623.44	
Assistants and		
Consultants	7,162.22	
Anesthetists	11,461.23	
X-ray and Radium...	11,253.50	
Laboratory and Misc..	7,703.69	
C.P.S. HOSPITAL COSTS..	30,276.39	
Ward Care	23,368.15	
Operating and		
Delivery Room	6,908.24	
TOTAL SERVICE COSTS..	\$235,710.44	

The handling of 25,000 bills each month has been developed efficiently, the result of many years of experimentation. C.P.S.'s pattern of getting statistical material and its method of paying bills have been studied by numerous investigators such as the Rockefeller Foundation, the California Assembly Interim Committee, the Senate Interim Committee and others.

The tremendous amount of material classified by our record-keeping system has been pronounced the most complete collection of information on prepaid medical care that exists in this country.

Untold possibilities in this field await our continuing studies.

In Memoriam

Alpert, Clarence Darrow. Died at Los Angeles, March 20, 1946, age 40. Graduate of Northwestern University Medical School, Chicago, Illinois, 1938. Licensed in California in 1938. Doctor Alpert was a member of the Los Angeles County Medical Association, the California Medical Association, and a Fellow of the American Medical Association.

Baker, Robert Vivian. Died at Napa, August 25, 1946, age 52. Graduate of Rush Medical College, Illinois, 1922. Licensed in California in 1922. Doctor Baker was a member of the Los Angeles County Medical Association, the California Medical Association, and a Fellow of the American Medical Association.

Blecker, Ralph Franklin. Died at Fresno, August 14, 1946, age 42. Graduate of the University of Nebraska College of Medicine, Omaha, 1927. Licensed in California in 1927. Doctor Blecker was a member of the

Fresno County Medical Society, the California Medical Association, and a Fellow of the American Medical Association.

Brownlie, James William. Died at San Francisco, June 26, 1946, age 62. Graduate of Cooper Medical College, San Francisco, 1908. Licensed in California in 1909. Doctor Brownlie was a member of the Solano County Medical Society, the California Medical Association, and a Fellow of the American Medical Association.

Clark, Milton Francis. Died at Cloverdale, August 13, 1946, age 63. Graduate of Cooper Medical College, San Francisco, 1910. Licensed in California in 1911. Doctor Clark was a member of the Sonoma County Medical Society, the California Medical Association, and a Fellow of the American Medical Association.

Eklund, Oscar Eric. Died at San Francisco, June 7, 1946, age 68. Graduate of the College of Physicians and Surgeons of San Francisco, 1902. Licensed in California in 1904. Doctor Eklund was a Retired Member of the San Francisco County Medical Society, the California Medical Association, and an Affiliate Fellow of the American Medical Association.

Finch, Arthur Alexander. Died at Pasadena, June 9, 1946, age 74. Graduate of the Hahnemann Medical College of the Pacific, San Francisco, 1892. Licensed in California in 1892. Doctor Finch was a member of the Los Angeles County Medical Association, the California Medical Association, and a Fellow of the American Medical Association.

Gundry, Frank Joseph. Died at Rochester, Minnesota, June 18, 1946, age 69. Graduate of Cooper Medical College, San Francisco, 1906. Licensed in California in 1906. Doctor Gundry was a member of the Kern County Medical Society, the California Medical Association, and a Fellow of the American Medical Association.

Hull, John Franklin. Died at Alhambra, June 13, 1946, age 70. Graduate of the State University of Iowa College of Medicine, Iowa City, 1898. Licensed in California in 1916. Doctor Hull was a member of the Los Angeles County Medical Association, the California Medical Association, and a Fellow of the American Medical Association.

Miller, Lena Augusta Geraldson. Died at Napa, August 14, 1946, age 74. Graduate of the Cooper Medical College, San Francisco, 1903. Licensed in California in 1903. Doctor Miller was a member of the Napa County Medical Society, the California Medical Association, and a Fellow of the American Medical Association.

Tebbe, Frederick Henry. Died at Oakland, June 27, 1946, age 75. Graduate of the University of California Medical School, Berkeley-San Francisco, 1902. Licensed in California in 1902. Doctor Tebbe was a member of the Alameda County Medical Association, the California Medical Association, and a Fellow of the American Medical Association.

NEWS and NOTES

NATIONAL • STATE • COUNTY

COLUSA COUNTY

In the hope of overcoming a dearth of doctors in Colusa County, William S. Randall, president of the Colusa Chamber of Commerce, has been authorized to appoint a committee to confer with the Board of Supervisors and other agencies interested in increasing medical service. War and the lure of more lucrative fields of endeavor, has left Colusa with only four medical men, one of them superintendent and surgical head of one of the units of the County Hospital and County Health Unit.

FRESNO

Dr. H. C. Habegger, now in the Indian service at Schurz, Nevada, plans to move into the newly remodeled medical building adjoining the Reedley Hospital, sometime in October or November.

LOS ANGELES

Dr. Ben G. Gurman has opened an office for the practice of medicine and surgery at 306 South First Avenue, Arcadia. Dr. Gurman, who was recently discharged from the Army, served in general hospitals in France and in the field in the Philippines.

Officials at the Huntington Memorial Hospital announced the appointment of seven internes for the year starting July 1, 1947, from 53 applications, twice as many as had ever been received before. Among the appointees were Dr. Ernest B. Porter and Dr. Alfred G. Knudson, Jr., of Pasadena.

The new Overland Medical Clinic which recently opened at 2516 Overland Avenue, Culver City, under the management of Frank C. Morgenroth, M.D., is open to other doctors and their patients as well. Dr. Morgenroth stated. The Clinic has been open to the public for the past two months. Dr. Morgenroth is a graduate of Loyola Medical University of Chicago.

Dr. Henry C. Ward has announced the opening of new offices at 135 E. 9th St., Long Beach, for practice in diseases of the chest. Prior to military service in the European and South Pacific Theaters, Dr. Ward was connected with the Los Angeles County Health Department as Tuberculosis Clinician.

Eleven physicians and surgeons from Los Angeles County have been appointed as civilian consultants to the Army Medical Department. They are: Dr. Thomas H. Sternberg, Dr. Paul Starr, and Dr. Robert M. Shelton, Internal Medicine; Dr. Clarence H. Goddard, Neuropsychiatry; Dr. Gordon K. Smith, General Surgery; Dr. Robert W. King, Orthopedics; Dr. Burton L. Stewart, Urology; Dr. Richard D. Pettit, Obstetrics and Gynecology; Dr. Fordyce A. H. Johnson, Ear, Nose and Throat; Dr. Richard S. Harrison, X-Ray; Dr. Grant Balding, Ophthalmology.

Dr. H. L. Gotfredson, released from the Army Medical Corps in July, has announced the reopening of his offices at 1141 Fremont Avenue, South Pasadena. While in the Army, Dr. Gotfredson was on the staff of the hospital at Camp Swift, Texas.

After a long illness, Dr. J. O. Wilke of North Grand Avenue, Covina, will take up practice again at his new offices at 218 West Badillo Street, Covina.

Dr. Willis Jacobus has succeeded Dr. Packard Thurber as University of Southern California athletic medical director. Dr. Thurber, after 21 years as medical director, resigned to devote all his time to general practice.

Retirement of Dr. William L. Weber as chief surgeon of the Pacific Electric Hospital Association after 33 years of service has been announced by O. A. Smith, president of the railway. Dr. Weber will be succeeded by Dr. A. M. Scholz.

PLACER-NEVADA-SIERRA

Members of the Placer-Nevada-Sierra Medical Society have decided to erect a hospital in western Nevada County, it was announced by Dr. O. F. Lang, who has been chosen chief of staff of the projected hospital. The cost will be financed primarily by the officers and members of the society. The following physicians have been chosen to serve on the new staff: Dr. Lang, chief; Dr. B. W. Hummelt, assistant chief, and Dr. Daniel M. Hirsch, secretary-treasurer. Drs. G. A. Foster, O. P. Fry, H. L. Karo, H. N. March, S. F. Tobias and F. L. Smith are members.

SAN BERNARDINO

Dr. Albert Wical, an ex-Navy physician and surgeon, is now associated with Dr. Nile I. Reeves in Banning. Both Dr. Reeves and Dr. Wical are graduates of the College of Medical Evangelists at Loma Linda.

Major Kenneth A. Abbott, Ontario physician and surgeon, has been awarded the Bronze Star "for meritorious achievement in connection with military operations against the enemy on Cebu, Philippine Islands, from March 26 to April 25, 1945." Doctor Abbott is at present taking special work at the Mayo clinic, Rochester, Minnesota.

SAN FRANCISCO

Dr. J. C. Geiger, who has received many foreign decorations for his work in public health, recently was honored by his own city for serving 15 years as health director. City officials and members of the medical fraternity called upon him to extend congratulations, and employees of the department presented him with a testimonial scroll.

After nearly half a century of practice and teaching, Dr. Harold Brunn has retired from practice. The 72-year-old surgeon came to San Francisco in 1897. He was for many years clinical professor of surgery at the University of California, and gave his own funds to establish the thoracic clinic of the school at the San Francisco Hospital. Later he reorganized Mount Zion Hospital and established it as a medical research center. More recently he established a heart disease research institute, now known as the Harold Brunn Institute for Cardiovascular Research.

A study of alcoholism in San Francisco is soon to be undertaken by the Mental Hygiene Society of Northern California, according to recent announcement by Jack Spear, executive secretary. The society expects the study will lead to an organized educational program with cooperation from other interested organizations.

"San Francisco is one of the largest consumers of alcoholic beverages in the United States," reports the Society. "Of each 100,000 of the San Francisco population there are 411 chronic alcoholics."

Cost of alcoholic patients at San Francisco Hospital for the year 1945-46 was \$66,998.75 and at the Emergency Hospitals was \$8,455.49, totaling \$75,454.24.

454.22, according to Dr. J. C. Geiger, Health Director. "This," he said, "by no means represents the total cost of alcoholism in the emergency hospitals, as many accidents, such as falls and automobile accidents are of alcoholic origin."

The proposed community education program, according to Mental Hygiene Society plans, will be directed to the general public, as well as professional persons. It will cover the nature, causes and treatment of alcoholism.

SAN JOAQUIN

The San Joaquin Medical Society has announced reactivation of the **Stockton Post-Graduate Study Club** after four years of inactivity. The program of lectures covering a wide range of medical subjects will be delivered by prominent men in the medical world. The Stockton Postgraduate Study Club, with club rooms in the Medico-Dental building, is the only one of its kind in California outside of Los Angeles, according to Dr. C. A. Broadus, Study Club chairman.

Dr. Louis L. Ghiglieri has resumed his practice of medicine at 940 N. Hunter, Stockton, after more than three years of army service. During his overseas duty he attended lectures at the Oxford University School of Medicine, and the School of Medicine at the University of Heidelberg, in Germany. Dr. Ghiglieri is a graduate of Stanford University School of Medicine.

SANTA CLARA

Dr. F. R. Anderson, who was released from active duty in the Navy last fall, will have offices in the newly renovated building at 71 North Baldwin, **Sierra Madre**.

A program of training in neuropsychiatry including clinical instruction and residence training for doctors has been started by the Veterans' Administration Hospital in North Palo Alto.

Training will be given to doctors in three brackets. (1) The regular physicians on the hospital staff who wish to brush up on certain subjects, (2) 30 doctors, veterans of the war, who wish to study neuropsychiatry so as to be able to pass the American Board examinations in this field, and (3) 25 recent medical school graduates who received their education under either the Army Specialized Training Program or the Navy's V-12 plan.

TULARE

Dr. W. P. Bowen, who has been a practicing physician in **Lindsay** for 25 years, has retired. Dr. Bowen's practice has been taken over by **Dr. Arthur A. Mickel**, who, though a resident of Lindsay, has had his offices in Exeter.

GENERAL NEWS

Appointment of new faculty to the **School of Public Health, University of California**, is announced by Dr. W. McD. Hammon, Dean.

Dorothy Nyswander, Ph. D., has been engaged as Professor of Health Education. Dr. Nyswander is a graduate of the University of California. She is nationally known in public and school health education circles and has recently been engaged in the educational program of the Office of the Coordinator of Inter-American Affairs.

Leon Lewis, M.D., has been appointed Professor of Industrial Health. A graduate in medicine of the University of Pennsylvania, Dr. Lewis was for a time staff physician and director of laboratories for

the California State Department of Institutions at Sonoma State Home. For 12 years he was engaged in private consultation and laboratory practice in industrial medicine in Newark, N. J., and New York City. During the war, Dr. Lewis was a commander in the U. S. Navy.

Miss Edith Lindsay has been appointed Assistant Professor in Hygiene. Miss Lindsay graduated from Stanford University and has taught hygiene in that institution and at Mills College.

J. J. Gallagher, manager, has announced the appointment of Frank J. Filippi as Claims Superintendent for the **State Compensation Insurance Fund**. He succeeds P. G. McWhinney who, after 18 years of service, has reached the retirement age under the State Retirement System. Mr. Filippi has been a member of the Fund's legal staff since 1934.

The resident training program in neuropsychiatry at the Los Angeles Veterans Administration Center, which began August 15, still has vacancies available for veterans who desire specialized training in neuropsychiatry. The program prepared by the Deans' Subcommittee on Neuropsychiatry is designed to prepare the resident for the examination of the American Board of Psychiatry and Neurology. Faculty members of the medical schools of University of Southern California and College of Medical Evangelists are participating in the training program.

Courses in psychopathology, clinical psychiatry, neuropathology and clinical neurology are being given the current semester. Staff conferences and rounds with consultants are part of the training.

Inquiries should be addressed to Dr. Samuel D. Ingham, Chairman of the Deans' Subcommittee on Neuropsychiatry, 727 West Seventh Street, Los Angeles 14, California; or to the Director of Clinical Psychiatry, Neuropsychiatric Hospital, Veterans' Administration Center, Los Angeles 25, California.

A retirement program for employees in nonprofit hospitals throughout the country has been launched by the American Hospital Association. As a result of studies by a pension committee, a special plan for hospitals has been developed in cooperation with the National Health and Welfare Retirement Association.

In making this announcement, John H. Hayes, president-elect of the Hospital Association and chairman of its pension committee, pointed out that hospital workers are not now covered by social security benefits and for this reason hospitals are at a disadvantage in employing high-grade workers.

The plan provides for joint employee and employer contributions, the optional provision by the hospital of benefits for past service, fully vested rights for retirement purposes to the employer's contributions and transferability between hospitals which are members of the plan. In case of death the employee's contributions plus interest are paid to his beneficiary. All permanent employees over 25 years of age, with one year or more of service, are eligible to join provided the hospital votes to make the payments on a payroll deduction basis.

The fifth annual meeting of the **American Academy of Dermatology and Syphilology** is scheduled for Cleveland, Ohio, December 7-12, it is announced by Dr. Earl D. Osborne, Secretary of the Academy, 471 Delaware Ave., Buffalo, N. Y. This will be the first meeting of the group since December, 1941, and

it is expected to attract more than 1,000 members, according to Dr. Osborne.

Principal sessions will be held at the Statler hotel with **daily symposia** at the Allerton hotel and teaching clinics at Cleveland City hospital Monday, Tuesday, and Wednesday of the convention week. The meeting will feature **special lectures** by members of the Academy and by famed authorities in such other fields as atomic energy, radiology, and surgery.

Most special lectures, special courses and symposia will be presented on the first four days of the week, beginning December 9.

The American Association for the Study of Goiter again offers the Van Meter Prize Award of \$300 and two honorable mentions for the best essays submitted concerning original work on problems related to the thyroid gland. The Award will be made at the annual meeting of the Association which will be held in Atlanta, Georgia, April 3, 4, and 5, 1947, provided essays of sufficient merit are presented in competition.

The competing essays may cover either clinical or research investigations; should not exceed 3,000 words in length; must be presented in English; and a typewritten double spaced copy sent to the corresponding secretary, **Dr. T. C. Davison**, 207 Doctors Building, Atlanta 3, Georgia, not later than January 1, 1947. The committee which will review the manuscript is composed of men well qualified to judge the merits of the competing essays.

A place will be reserved on the program of the annual meeting for presentation of the Prize Award Essay by the author if it is possible for him to attend. The essay will be published in the annual Proceedings of the Association. This will not prevent its further publication, however, in any journal selected by the author.

The American Academy of Allergy will hold its annual convention at Hotel Pennsylvania, New York City, November 25-27 inclusive. Physicians interested in allergic problems are invited to attend the sessions as guests of the Academy without payment of registration fee. The program has been arranged to cover a wide variety of conditions where allergic factors may be important. Papers will be presented dealing with the **latest methods of diagnosis and treatment** as well as the results of investigation and research. Advance copies of the program may be obtained by writing to the Chairman on Arrangements, **Dr. Horace S. Baldwin**, 136 East 64th Street, New York City, before November 10.

Formation of the Medical Advisory Council to the **National Cancer Foundation** with **Dr. George T. Pack** as its chairman was announced last month. Need for hospital facilities for treatment and terminal care of the great number of patients with incurable cancer is "one of the most urgent public health

problems of the day," Dr. Pack said. Purpose of the hospitalization of the advanced cancer patient "is not solely to relieve any home or family of a difficult social and financial burden, but more important still, to do something for the unfortunate patient," he said.

The Advisory Council will work with Julius Jay Perlmutter, president of the National Cancer Foundation, under the direction of Dr. Pack.

Other members of the Council, which is as yet incomplete, will be: Dr. Halsey Bagg, Dr. Gemma Barzilai, Dr. E. V. Cowdry, Dr. Howard J. Curtis, Dr. Andrew J. Donnelly, Dr. G. Failla, Dr. Benjamin L. Feuerstein, Lt. Colonel Milton Friedman, Dr. Harry B. Friedgood, Dr. Richard H. Hoffman, Dr. Ira I. Kaplan, Dr. Daniel Laszlo, Dr. Michael Levine, Dr. Rudolph Matas, Dr. Edgar Mayer, Dr. George P. Miley, Dr. Sherwood Moore, Dr. John E. Mosley, Dr. Frank Ober, Dr. George T. Pack, Dr. Stanley P. Reimann, Dr. Simon L. Ruskin, Colonel Albert E. Russell, Dr. Isabel Scharnagel, Dr. Joseph O. Smigel, Dr. George M. Smith, Dr. Henry K. Wachtel, Colonel Stafford L. Warren.

Addition of **Rear Admiral Lucius W. Johnson** (MC) United States Navy (retired) to the staff of the **American College of Surgeons** is announced by the College. Dr. Johnson is at present the field representative of the College in the Pacific Coast area where he is conducting surveys in Hospital Standardization and Graduate Training in Surgery.

Four California doctors are among the 19 medical men recently named as members of the National Medical and Scientific Advisory Council of the **National Arthritis Research Foundation**. They are **Dr. Harry James Deuel, Jr.**, bio-chemist, University of Southern California School of Medicine; **Dr. Herbert McLean Evans**, professor of Anatomy and director of the Institute of Experimental Biology, University of California; **Dr. Karl F. Meyer**, professor of Medicine and director of the George Williams Hooper Foundation for Medical Research, University of California; and **Dr. Franklin Richards Nuzum**, director of Cardio-Vascular Research at the Santa Barbara Cottage Hospital.

Two fellowship for study of **rheumatic heart disease**, have been awarded by the **American Legion** and its auxiliary from a fund of \$50,000 they subscribed to fight the "nation's greatest child killer." The fellowships go to two war veteran doctors. One is **Dr. Samuel T. Schlamowitz**, who will act as research fellow under **Dr. Arthur C. DeGraff** and **Dr. Samuel A. Brown**, professor of therapeutics, New York University College of Medicine. The other is **Dr. Joseph Warren**, who, under the direction of **Dr. T. Duckett Jones**, will study the changing glandular conditions of the body affecting rheumatic conditions, at the House of the Good Samaritan in Boston.



INFORMATION

Steps in Buying War Surplus Medical Equipment

Medical men who are veterans of World War II are in a favorable position to purchase professional equipment and supplies through the War Assets Administration.

The two regional WAA offices in California estimate they have already materially aided hundreds of California medical men in reestablishing themselves professionally through purchases of surplus war items.

The variety of medical and surgical equipment which WAA has sold, is selling or will sell, is as extensive or as restricted as the surplus supplies from the sources from which it originates, the military forces. Some items—and many medical items among them—are in relatively short supply.

Many items in short supply, for which the veteran demand is large, have been put upon a "set aside" list. Until further notice, these items can be sold only to veterans of World War II. The usual rule is "one unit to a customer."

The fact that merchandise is included on the "set aside" list is no warranty that it is available for veteran buyers. War Assets can sell only property which has been declared surplus and many "set aside" items are in such short supply to WAA that only a fraction of the would-be buyers will ever get them.

The "set aside" list includes such medical and surgical equipment as cystoscopes, slit lamps, eye, ear, nose and throat diagnostic cases, x-ray equipment and accessories, physiotherapy equipment, including baths and baking equipment; laboratory equipment such as microscopes and accessories; stereoscopes; miscellaneous hospital equipment such as tables, lamps, stools, sterilizers.

Other items, although not peculiar to the medical profession, are also on the set-aside list. They include a great variety of various types of items, including typewriters, desks, chairs, cabinets and tables.

Medical items are generally sold at about one-half the original cost to the government.

To become eligible to purchase goods from WAA under a veteran's high priority, a professional man, like other veterans of World War II, must be certified at one of the WAA veterans' offices. There are ten of these in the San Francisco region alone. There are scores in other regions throughout the country.

Northern California certification offices are located at: 1540 Market Street, San Francisco; Civic Auditorium, Oakland; Chamber of Commerce Building, Sacramento; Chamber of Commerce Building, Stockton; 2138 Merced Street, Fresno; 1407 California Street, Redding; Army Headquarters, East Alisal Street, Salinas; 2510 M Street, Bakersfield, and Fourth and Ryder Streets, Vallejo.

In Southern California there are certification offices at 450 Fargo Street, Indio; 241 W. Broadway, Long Beach; 3636 W. Beverly Boulevard, Los Angeles; 100 E. Carrillo, Santa Barbara; 388 4th Street, San Bernardino and 4205 Pacific Highway, San Diego.

Before being certified, a veteran must present a copy (a photostatic copy will do) of his discharge papers or terminal leave orders to WAA veterans' certification office. If buying strictly medical supplies and equipment, the veteran must also present evidence of his profession. Usually this evidence is sufficiently noted on his service papers.

He is then assigned a case number which shows his relative precedence in date of application. This number is important for in the case of such critically short items as certain medical and surgical equipment allocation is made to veterans whose case numbers are the lowest; in other words, to those who applied first.

After certification, the veteran's name is placed on a list to receive notice of sale of the type of items for which he is applying. When the material becomes available, he is sent a catalog.

Upon receiving such a catalog he may make his proposed selections. Most such transactions are carried on by mail. Delivery is often made within 48 hours after a sale closes.

Credit and installment contracts are available to those who qualify.

If the material requested is not located in this region, a special division makes a nation-wide search. It is a rule of the Veterans' Division of WAA, whose personnel is made up largely of veterans of World War II, to turn nobody away without an answer. In order to find the answer, WAA has the advice of a number of specialists long experienced in medical and surgical sales.

It is to commercial channels that the medical man who is not a veteran of World War II must look in buying surplus property sold by WAA. Items sold to commercial channels are generally in relatively long supply or of such a nature that it is advisable to sell them quickly, hence in large quantities. Some items in particularly long supply are available for export.

Veterans of World War II have a high priority also to purchase the so-called "long supply" items. However, instead of rating a top priority as in the case of set-aside items, they rate second priority. The federal government has the first and highest priority to purchase "long supply" items.

WAA officials themselves caution medical men against undue hopes of obtaining any and all equipment they need from the WAA. The set-aside list, it was explained, is itself as far as a listing considered more or less permanent—but because items are listed on the set-aside list does not mean they have been physically set aside themselves. Such items are not available at all times.

For example, microscopes have been listed in the set-aside list for some time, but only a minor trickle has been declared surplus and available for sale.

Medical items which are sold, having generally originated from either the Army or the Navy, are as a rule standard medical equipment. However, for personal satisfaction, WAA recommends inspection of any potential purchase for items are generally sold on a "where is, as is" basis.

Efforts are also made by WAA to effect an equal distribution of medical items on the basis of population in regions in the United States. Thus each area is, as far as is humanly possible, guaranteed a fair share of scarce items, although the items themselves may be stored in a distant part of the country.

If you are an eligible veteran, WAA urges the earliest possible certification, for Robert M. Littlejohn, national Administrator, has set next July 1 as the "target date" for the sale of the major portion of all surplus.

Letters to the Editor . . .

THE ARMY MEDICAL LIBRARY

Physicians who served in World War II have genuine occasion to be thankful for the splendid services rendered by the Army Medical Library. Reference texts, periodicals, and micro-film of important reference material were sent promptly for the use of medical officers at medical installations anywhere that troops were operating. This service assisted materially in maintaining the high standard of technical efficiency accomplished by the medical service during the war.

Now that we are gradually returning to peace, it would be wise for physicians to remember the services which the Army Medical Library can continue to furnish. The Army Medical Library publishes a "Current List of Medical Literature" which all county societies may obtain, for the purpose of aiding in acquiring important current medical literature. The Army Medical Library will continue to assist physicians throughout the country in obtaining important medical literature, by request through an appropriate local medical library.

The Army Medical Library is the greatest repository for medical literature in the world. It has the largest and most complete collections of all types of medical books and journals in existence.

Unfortunately, the Army Medical Library at present is housed in an old fire trap of a building on the Washington Mall. Congress has, however, authorized the erection of a new building to house the Army Medical Library in proximity to the great Library of Congress. It is expected that funds for this new building will be provided at the next session of Congress. Physicians can help greatly in asking congressmen to support the work of the Army Medical Library.

To catalog and classify the great collections of the Army Medical Library is no slight task. The Index Catalog of the Army Medical Library is the most important index of world medical literature. The Army Medical Library cooperates closely with the American Medical Association in maintaining the *Quarterly Cumulative Index*, which is used so extensively by physicians and scientists everywhere to keep abreast of current medical advance.

California physicians have a particular interest in the Army Medical Library because it has assisted for so many years in maintaining the highest quality of medical library service on the Pacific Coast. The Army Medical Library helped in establishing the medical periodical service for rural physicians, first proposed by Doctor George Kress, and maintained by the Library of the University of California Medical Center. It might be wise for the California Medical Association to make arrangements with the University of California for the revival of this important service.

It is essential in the modern practice of medicine for physicians to keep abreast of current advances. This can best be done by systematic attention to important medical periodicals, where original work appears, or where appropriate references and reviews are given to significant new developments. It is essential that physicians always and everywhere support local medical library efforts. It is also essential that physicians throughout the country unite in giving the best possible support to the great

central collection of medical books which serves the whole country, the Army Medical Library.

CHAUNCEY D. LEAKE, M.D.
University of Texas Medical School,
Galveston, Texas.

CRYSTALLIZATION OF BACTERIAL TOXINS

Successful crystallization of tetanal and botulin toxins are reported by Lamanna¹ and associates of Camp Detrick, Maryland and Pillemer² and his coworkers of the Pathological Institute, Western Reserve University.

Lamanna inoculated five gallon carboy lots of a 0.3 per cent casein, 0.5 per cent glucose and 1 per cent alkali-treated corn steep liquor medium with *Clostridium botulinum*. Maximum toxin production was reached after 80 hours' incubation at 34°C. At this time the intraperitoneal mouse titer reached 800,000 MLD per cc.

In the first step of chemical purification the cultures were precipitated at pH 3.5 by the addition of HCl. The resulting "acid mud" consisted of a mixture of toxin, nucleic acid, undigested casein, material from corn steep and organisms. In seven succeeding steps the toxin was resuspended or redissolved in decreasing volumes of distilled water or salt solution. From each it centrifuged, salted out or otherwise separated from one or more of the contaminants. The final product was a 300-fold concentration of purified toxin in dilute sodium acetate solution. After standing overnight in the refrigerator, toxin crystals separated from this solution. Recrystallization was effected from a supersaturated distilled water solution.

The crystals thus obtained were needle-like structures from 5 to 7 microns in width, and 85 to 125 microns long. The crystals give positive protein reactions. Electrophoretic mobility suggested that the crystalline material was a single chemical substance. Membrane diffusion suggested a molecular weight between 1 and 2 million.

Adopting a somewhat similar technique Pillemer² and his associates isolated and crystallized tetanal toxin. Crystallization of the final product occurred slowly at -8°C from a 25 per cent methyl alcohol solution. The crystals disintegrated and redissolved in the mother liquor at temperatures above 0°C. Microscopically the crystals appeared as irregular triangular or rhomboid structures, with an occasional elongated spear-shaped form. Solutions of the crystals give positive protein reactions. The material showed constant biological activity on recrystallization. The toxicity was readily destroyed by heat, acid or alkali, confirming in this regard its assumed identity with tetanal toxin. Detailed studies of this crystalline toxic protein are now in progress.

W. H. MANWARING,
P. O. Box 51,
Stanford University.

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1. Lamanna, C., McElroy, O. E., and Eklund, H. W., *Science*, 103:613 (May 17), 1946.
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BOOK REVIEWS

A PRIMER FOR DIABETIC PATIENTS: An outline of Treatment for Diabetes with Diet, Insulin and Protamine-Zinc Insulin, Including Directions and Charts for the Use of Physicians in Planning Diet Prescriptions. By Russell M. Wilder, M.D., Ph.D., University of Minnesota; Senior Consultant in Division of Medicine, Mayo Clinic, Eighth Edition, Reset. 192 pages, with 8 illustrations. Philadelphia and London: W. B. Saunders Company, 1946. Price \$1.75.

This small book is written for patients. This, the 8th edition, continues to follow the excellent plan of the preceding editions in that it is written in a concise and non-technical manner, thus enabling patients to properly understand the ultimate goal of therapy.

Although no major changes have been made in the method of treating diabetes, many minor alterations in the procedures heretofore employed have been developed since publication of the 7th edition. These are included in the present volume.

As in the previous editions the author utilizes a procedure of first giving a brief discussion and then outlining, in question form, the salient points of the preceding chapter. The discussions are therapeutically sound, and written in a concise form so that little or no misunderstanding can result. The chapter on Protamine Zinc Insulin includes a brief discussion of the use of mixtures of various insulins which has been recommended by several clinicians as being a satisfactory method of supplying the necessary insulin in a single injection.

There is included in this edition a chapter for the physician, on "Diet" which is a very sound discussion of this part of the therapy for diabetes. Although Dr. Wilder qualifies this chapter by stating that the type of treatment best suited for the individual diabetic patient should be left to the judgment of the physician, he nevertheless summarizes a dietary regime which can be utilized to advantage particularly by those clinicians who treat diabetes infrequently.

Appended are the usual height and weight tables and the various food tables necessary for the patient to properly prepare menus which correspond to the physician's prescription.

This book is one of the better manuals for diabetic patients. It can be studied to advantage by both patients and clinicians.

MANSON'S TROPICAL DISEASES—A MANUAL OF THE DISEASES OF WARM CLIMATES. Edited by Philip H. Manson-Bahr, C.M.G., D.S.O., M.A., M.D., D.T.M. and H. Cantab, F.R.C.P., Lond. Senior Physician to the Hospital for Tropical Diseases, London, the Albert Dock Hospital and the Tilbury Hospital; Consulting Physician to the Colonial Office and Crown Agents for the Colonies; Consultant in Tropical Diseases to the Admiralty and to the Royal Air Force; Director, Division of Clinical Medicine, London School of Hygiene and Tropical Medicine; Lecturer on Tropical Medicine to the London Hospital; Corresponding Member of the Société de Pathologie Exotique; Member of the Washington Academy of Medicine; late Examiner in Tropical Medicine to the Conjoint Board of the Royal College of Physicians and Royal College of Surgeons, England, and to Cambridge and Hongkong Universities. Author (with A. Alcock) of "The Life and Work of Sir Patrick Manson," 1927; "The Dysenteric Disorders," 1939 and "Synopsis of Tropical Medicine," 1943. Twelfth edition. Cloth. Price, \$12.00. Pp. 1068 with 17 color plates, 9 half-tone plates, 406 figures in the text, 6 maps, and 28 charts. A William Wood Book. Baltimore: The Williams and Wilkins Company, 1945.

The twelfth edition of this standard encyclopedic text is excellent. It reflects the many years of wide experience with tropical diseases which the British have had during their long period of prominence in tropical areas. More specifically it reflects the experiences of Sir Patrick Manson, the author of earlier editions and of Manson-Bahr, who has carried on in later years. In it physicians

will find excellent descriptions of the clinical phases of tropical diseases. The tone of the volume, characteristically British, is conservative.

The chapter on rickettsiosis has been fully revised, and that on leprosy modernized. The latter change in particular is a desirable one.

The author states in the preface that special attention has been devoted to malaria, yellow fever and nutritional diseases. The American clinician with experience in World War II will be somewhat disappointed to find in this book, published in 1945, little data on experiences with suppressive therapy of malaria with chemical substances and on the use of D.D.T. Furthermore, none of the experiences of Americans with filariasis and tsutsugamushi fever in the Pacific Islands are mentioned in the book. Not all of this material was restricted information in 1945. American clinicians will furthermore not be concerned too much with advanced states of deficiency disease in the tropics. Among military personnel these conditions rarely occurred except in prisoners of war, and most natives unmolested do not acquire them. Deficiency disease should hardly be thought of or classified as tropical diseases.

Despite these minor criticisms, this book ranks high and is one of the best on the subject.

QUICK REFERENCE BOOK FOR MEDICINE AND SURGERY. Thirteenth edition. By George E. Rehberger, A.B., M.D. J. B. Lippincott Company. A clinical, diagnostic, and therapeutic digest of general medicine, surgery, and the specialties, compiled systematically from modern literature.

Dr. Rehberger has written an extremely useful book for the general practitioner of medicine. It is encyclopedic in its scope, logical and orderly in development, perhaps a little ponderous in places (some of the material could have been advantageously deleted), but on the whole it is remarkable, especially in the field of therapeutics, where both the art and science of treatment are ably discussed. The information is amazingly up-to-date.

The book is organized for quick reference, because the diseases discussed are arranged in alphabetical order, and for the various specialties it is further refined, since the subject matter of the specialist is set off in sections by thumb tabs. This volume should be on the bookshelf of every clinician.

COMPLETE HANDBOOK ON STATE MEDICINE. By J. Weston Walch. 1946. 170 pages, 8½x11 inches, lithographed. Platform News Publishing Co., Box 66, Pearl St. Station, Portland, Maine. Price \$2.50 per copy.

This is a rather remarkable booklet containing most of the well known arguments for and against compulsory sickness insurance (as exemplified by such measures as the Wagner-Murray-Dingell Bill). The author has apparently been exposed to some sound reading on the art of debate and the technique of the well tossed argument. The book is not easy reading; the ink on some of the pages of your reviewer's copy printed out a light grey. The absence of double spacing the paragraphs results in crowding too much text on one page.

Despite these defects, the handbook is recommended to all thinking physicians who would be prepared to discuss the problems involved in the wider distribution of medical services with their patients and friends.

UROLOGIC ROENTGENOLOGY. By Miley B. Wesson, M.D., Ex-President American Urological Association, San Francisco, California, second edition, thoroughly revised,

published 1946. Octavo 259 pages, illustrated with 258 engravings. Cloth, \$5.50. Lea & Febiger, Washington Square, Philadelphia.

The second edition of Wesson's book has been completely revised and is the only recently published book on urologic roentgenology. The newer procedures of urography, including technique, pitfalls and complications are thoroughly discussed and there are instructive chapters on the history and technique of urography. The illustrations are numerous, many new ones having been added; they are well defined and clearly picture the ordinary urologic conditions. The urograms, mostly from the author's cases, partly culled from a widespread source of material, are

reproduced clearly on excellent paper. A complete explanation and case discussion accompanies each illustration and in many cases an informative schematic outline aids in their interpretation. The text is also well filled with concise but satisfactory discussions of etiology, pathology, symptomatology and treatment.

This book is a compact, easily used reference work covering the usual urologic conditions. It is a satisfactory consulting source for the part-time or student urologist. It should also be a valuable aid to the great numbers of physicians who do not have ready access to expert urologic or roentgenologic consultation. The author makes no claim for it as a complete text on urography.

MEDICAL JURISPRUDENCE

INTERPRETATION OF THE BUSINESS AND PROFESSIONS CODE PERTAINING TO A HEARING FOR REINSTATEMENT OF A DOCTOR WHOSE LICENSE HAS BEEN REVOKED

HARTLEY F. PEART, Esq., *San Francisco*

A decision recently rendered by the Superior Court of Los Angeles County is of interest to the legal and medical professions alike because of its interpretation and construction of a new section of the Business and Professions Code.

The petitioner sought a writ of mandate to compel the Board of Medical Examiners to grant him a hearing on a petition for reinstatement. In 1922 a reciprocity license based upon a license previously issued to him by the State of Missouri was issued in California to the petitioner. On October 18, 1932, this reciprocity license was revoked by the Board of Medical Examiners on the ground that the Missouri license had been procured by fraud and false representation. The fraud and misrepresentation upon which the Board based its order of revocation were evidenced by depositions of three witnesses taken October 17, 1928. The petitioner was not present at the hearing in Sacramento, although he had had due notice, claiming he was prevented from going from Los Angeles to Sacramento because his presence was required in court in Los Angeles on the same date. The order of revocation issued on October 18, 1932, was reviewed by the Superior Court in Los Angeles County and annulled by that court. On appeal, however, the District Court of Appeal of the State of California reversed that judgment, holding that in making its order of revocation the Board did not exceed its jurisdiction. (See *Rinaldo vs. Board of Medical Examiners*, 5 Cal. App. 2nd, 345.)

The petitioner recently filed a petition with the Board requesting an opportunity to present evidence which he contended would establish the falsity of the proofs presented to the Board at the hearing on October 18, 1932. It was claimed on his behalf that *Section 2376.5 of California Business and Professions Code*, first enacted in 1943, entitled him as a matter of right to a hearing for the purpose of reinstating the revoked certificate. This section is as follows:

"A person, whose certificate has been revoked or

suspended for more than one year, may petition the Board to reinstate the certificate after a period of not less than one year has elapsed from the date of the revocation or suspension."

The Board, upon presentation of the petition, declined to hear it or receive any evidence under it upon the ground that the section in question only authorized hearings on petitions based upon revocation of a license which had been valid when issued and not upon revocation of a license which had been issued improperly upon fraudulent representations.

The Los Angeles Superior Court held that this new section of the Business and Professions Code made it mandatory for the Board to grant a hearing on the petition for reinstatement of the license of any doctor whose license has been revoked. The court said that "by its terms, one who formerly held a license to practice medicine in California whose certificate had been revoked, is granted the right to petition the Board to reinstate the certificate after a one year period from date of revocation." Continuing, the court held that by filing his petition, petitioner placed upon the Board the duty to entertain, hear and determine such petition, on the hearing of which petitioner could offer testimony that the original evidence was false in all material points in an effort to show that the order of revocation issued on October 18, 1932, should be rescinded.

In the words of the court: "As a remedial act, this section of the Business and Professions Code must be liberally construed so as to effectuate its object and purpose and to bring within the scope of the law every case which comes clearly within its spirit and policy. It is clear that the legislature intended to furnish the Board of Medical Examiners authority and power to take upon petition and review any order of revocation and suspension."

Thereupon, it was ordered that a writ of mandate be issued directing the Board of Medical Examiners to grant petitioner a hearing and enter a decision upon his petition.